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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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INTRODUCTION

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Five indexes are included in each issue: subject, personal author, corporate source, contract number, and report/accession number. Cumulative index volumes are published semiannually and annually.

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The authority for the indexing vocabulary used in the subject index of this issue of *STAR* is the *NASA Thesaurus*. The most recent version is the *NASA Thesaurus—Alphabetical Update* (NASA SP-7040), September 1971, which is available from NTIS as accession number N72-15923 for $6.00 in paper copy. The current cross-reference structuring for each term appears in this volume, together with additional approved terms that may be used in indexing documents announced in other issues of *STAR*. NASA SP-7040 supersedes the first two volumes (subject terms A–Z) of the three-volume *Preliminary Edition of the NASA Thesaurus* (NASA SP-7030), December 1967. Volume III of the Preliminary Edition presented the following aids to vocabulary selection of the 1967 terms: hierarchical display of index terms, category terms listing, and permuted index; this has not been updated but may still be useful.

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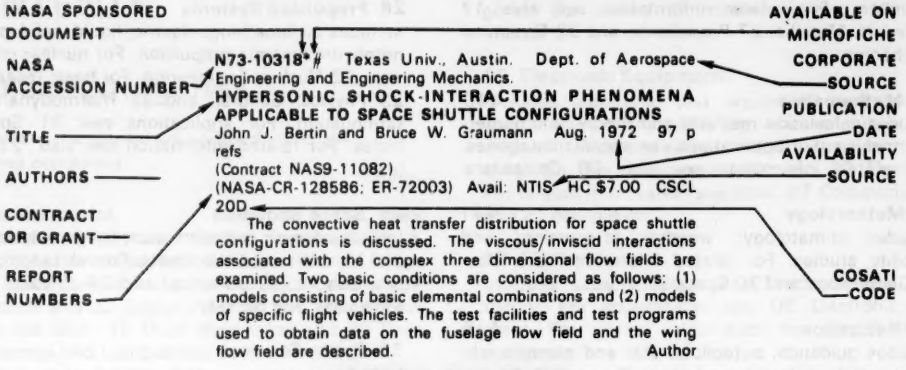
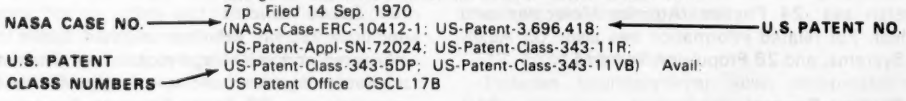


N73-10318*# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
HYPERSONIC SHOCK-INTERACTION PHENOMENA APPLICABLE TO SPACE SHUTTLE CONFIGURATIONS
John J. Bertin and Bruce W. Graumann Aug. 1972 97 p refs
(Contract NAS9-11082)
(NASA-CR-128586; ER-72003) Avail: NTIS HC $7.00 CSCL 20D

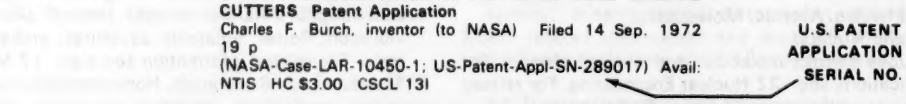
The convective heat transfer distribution for space shuttle configurations is discussed. The viscous/inviscid interactions associated with the complex three dimensional flow fields are examined. Two basic conditions are considered as follows: (1) models consisting of basic elemental combinations and (2) models of specific flight vehicles. The test facilities and test programs used to obtain data on the fuselage flow field and the wing flow field are described. Author

PATENT CITATION



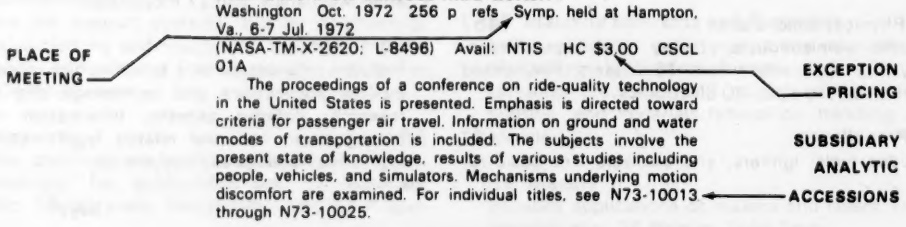
N73-12211* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ALTITUDE MEASURING SYSTEM Patent
George B. Litchford, inventor (to NASA) Issued 3 Oct. 1972 7 p Filed 14 Sep. 1970
(NASA-Case-ERC-10412-1; US-Patent-3,696,418; US-Patent-Appl-SN-72024; US-Patent-Class-343-11R; US-Patent-Class-343-5DP; US-Patent-Class-343-11VB) Avail: US Patent Office CSCL 17B

PATENT APPLICATION CITATION



N73-10504*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
GRINDING ARRANGEMENT FOR BALL NOSE MILLING CUTTERS Patent Application
Charles F. Burch, inventor (to NASA) Filed 14 Sep. 1972 19 p
(NASA-Case-LAR-10450-1; US-Patent-Appl-SN-289017) Avail: NTIS HC $3.00 CSCL 13I

PRIMARY ANALYTIC CITATION AND ABSTRACT



N73-10012*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SYMPOSIUM ON VEHICLE RIDE QUALITY
Washington Oct. 1972 256 p refs Symp. held at Hampton, Va., 6-7 Jul. 1972
(NASA-TM-X-2620; L-8496) Avail: NTIS HC $3.00 CSCL 01A

The proceedings of a conference on ride-quality technology in the United States is presented. Emphasis is directed toward criteria for passenger air travel. Information on ground and water modes of transportation is included. The subjects involve the present state of knowledge, results of various studies including people, vehicles, and simulators. Mechanisms underlying motion discomfort are examined. For individual titles, see N73-10013 through N73-10025.

SUBSIDIARY ANALYTIC CITATION

N73-10014* Douglas Aircraft Co., Inc., Long Beach, Calif.
AN AIRCRAFT MANUFACTURER'S APPROACH TO RIDEABILITY CRITERIA
R. C. OMassey, H. Leve, and J. G. Gaume *In* NASA. Langley Res. Center Symp. on Vehicle Ride Quality Oct. 1972 p 23-49 refs (For availability see N73-10012 01-02)
CSCL 01A

VOLUME 11 NUMBER 4 / FEBRUARY 23, 1973

Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N73-12999*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EFFECT OF NOZZLE LATERAL SPACING ON AFTERBODY DRAG AND PERFORMANCE OF TWIN-JET AFTERBODY MODELS WITH CONE PLUG NOZZLES AT MACH NUMBERS UP TO 2.20

Bobby L. Berrier Washington Dec. 1972 132 p refs

(NASA-TM-X-2632; L-8481) Avail: NTIS HC $3.00 CSCL 01A

Twin-jet afterbody models were investigated by using two balances to measure separately the thrust minus total drag and the afterbody drag at Mach numbers of 0.0 and 0.50 to 2.20 for a constant angle of attack of 0. Translating shroud cone plug nozzles were tested at dry and maximum afterburning power settings with a high-pressure air system used to provide jet total-pressure ratios up to 20.0. Two nozzle lateral spacings were studied by using afterbodies with several interfairing shapes. The close- and wide-spaced afterbodies had identical cross-sectional area distributions when similar interfairings were installed on each. Nozzle cant angles of -5, 0, and 5 degrees were investigated. The results show that the highest overall performance was generally obtained with the close-spaced afterbody, basic interfairings (no base), and uncanted nozzles. Author

N73-13000*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

GAS CROSSFLOW EFFECTS ON AIRFLOW THROUGH A WIRE-FORM TRANSPIRATION COOLING MATERIAL

Albert Kaufman, Louis M. Russell, and David J. Poferl Washington Dec. 1972 13 p refs

(NASA-TM-X-2687; E-7147) Avail: NTIS HC $3.00 CSCL 01A

An experimental analysis was conducted to determine the effects of gas stream flow parallel to the discharging surface on the flow characteristics of a wire-form porous material. Flow data were obtained over a range of transpiration airflow rates from 0.129 to 0.695 grams per second-centimeter squared and external gas stream Mach numbers from 0 to 0.46. The conclusion was drawn that the flow characteristics of the wire cloth were not significantly affected by the external gas flows. Author

N73-13001*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

NUMERICAL METHOD FOR DESIGN OF MINIMUM-DRAG SUPERSONIC WING CAMBER WITH CONSTRAINTS ON PITCHING MOMENT AND SURFACE DEFORMATION

Russell B. Sorrells and David S. Miller Washington Dec. 1972 47 p refs

(NASA-TN-D-7097; L-8585) Avail: NTIS HC $3.00 CSCL 01B

A numerical method, based on linearized theory, for designing minimum-drag supersonic wing camber surfaces of arbitrary planform for a given lift, with options for constraining the pitching moment and/or the surface deformation at the trailing edge of the root chord and for selecting any desired combination of eight specified wing-loading distributions to be employed in the optimization procedure is presented. Two examples are given to illustrate applications of the method. The results indicate that relatively small drag penalties are incurred in designing wings to be self-trimming and to have a reasonable camber surface. Author

N73-13002*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EFFECT OF WING DESIGN ON THE LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF A WING-BODY MODEL AT SUBSONIC SPEEDS

William P. Henderson and Jarrett K. Huffman Washington Dec. 1972 58 p refs

(NASA-TN-D-7099; L-8562) Avail: NTIS HC $3.00 CSCL 01A

An investigation has been conducted to determine the effects of wing camber and twist on the longitudinal aerodynamic characteristics of a wingbody configuration. Three wings were used each having the same planform (aspect ratio of 2.5 and leading-edge sweep angle of 44 deg.) but differing in amounts of camber and twist (wing design lift coefficient). The wing design lift coefficients were 0, 0.35, and 0.70. The investigation was conducted over a Mach number range from 0.20 to 0.70 at angles of attack up to about 22 deg. The effect of wing strakes on the aerodynamic characteristics of the cambered wings was also studied. A comparison of the experimentally determined aerodynamic characteristics with theoretical estimates is also included. Author

N73-13003# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Aerodynamik.

MACH NUMBER EFFECT ON WAVE DRAG OPTIMIZED FUSELAGES AND PROFILES IN HYPERSONIC FLOW [DER EINFLUSS DER MACHZAHL AUF WELLENWIDERSTANDS-OPTIMIERTE RUEMPFE UND PROFILE BEIUEBERSCHALL-ANSTROEMUNG]

J. B. Wellmann 1972 34 p refs In GERMAN Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972

(DGLR-Paper-72-108) Avail: NTIS HC $3.75

The contour of wave drag optimized bodies of revolution is investigated as a function of Mach number. The minimum wave drag contours, calculated by the theory of slender bodies, are independent of Mach number, whereas some nonlinear optimizations indicate such an influence: From a consistent linearization of the conservation theorems, a closed linear theory is presented, by which the optimization of bodies of revolution is possible exactly and explicitly. The contours, represented by the flow function, contain the old solutions as asymptotic exceptions, and are valid also for higher Mach numbers. Author (ESRO)

N73-13004# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
LOW SPEED PULL-UP MANOEUVRES FOR A SLENDER WING TRANSPORT AIRCRAFT WITH STABILITY AND CONTROL AUGMENTATION
Dorothy M. Holford London ARC 1972 48 p refs Supersedes RAE-TR-70194; ARC-33169
(ARC-CP-1231, RAE-TR-70194; ARC-33169) Avail: NTIS HC $4.50; HMSO 65p; PHI $2.95

Low speed pull-up maneuvers for slender wing transport aircraft are calculated considering two extremes of aircraft weights (386,000 lb and 180,000 lb) and two center of gravity positions for each weight. Stability augmentation, in the form of angle of incidence and for rate of pitch feedback, and control augmentation are investigated as a means of improving the response of the aircraft in pull-up maneuvers. Author (ESRO)

N73-13005# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AERODYNAMIC INTERFERENCE BETWEEN A WING AND STORE M.S. Thesis
Charles L. Turner Jun. 1972 72 p refs
(AD-748348; GA/MC/72-6) Avail: NTIS CSCL 01/3

Simplified wing and store models are used to determine the aerodynamic interference effects between an aircraft and a store carried beneath its wing. Inviscid flow characteristics are calculated and the results compared to an experimental wind tunnel study. The resulting vertical forces are comparable to those from the wind tunnel study when modeling the wing with a single horseshoe vortex. The remaining forces and moments are not predicted accurately. Methods for correcting the differences are suggested. Modeling the wing with multiple horseshoe vortices changes the side force values to values comparable to those from the wind tunnel study. This indicates that the method can be extended to correct the other forces and moments to more realistic values. Author (GRA)

N73-13006# Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.
EXACT SOLUTION FOR LIFTING SURFACES
Peter F. Jordan Aug. 1972 50 p refs
(Contract F44620-69-C-0096; AF Proj. 9781)
(AD-748433; AFOSR-72-1737TR) Avail: NTIS CSCL 20/4

The obstacle which prevented the determination of exact lifting surface solutions was the singularity at the wing tip. This problem has now been solved analytically for the circular wing and thereby, to an extent, for wings with parabolic wing tips in general. The paper reports the analytical results. It describes how numerical solutions for the circular wing can conveniently be calculated if only engineering accuracy is required. Four linearly independent solutions have been determined to very high accuracy and are listed in tables; the tables are short since it is possible to split off the singularity. The samples confirm some expected and provide some unexpected insights into the mechanism of lifting flow. Author (GRA)

N73-13007# Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.
ON LIFTING WINGS WITH PARABOLIC TIPS
Peter F. Jordan Jul. 1972 50 p refs
(Contract F44620-69-C-0096; AF Proj. 9781)
(AD-748432; RIAS-TR-72-166; AFOSR-72-1738TR) Avail: NTIS CSCL 20/4

The structure of the singularity in the pressure distribution at parabolic wing tips is investigated on the circular wing model; it is determined on the basis of the remark that the given downwash is always regular at the tip. The solution is characterized by the occurrence of logarithmic sets. The major part of the solving set describes the singularity which is common to all solutions; the minor part which describes the special solution can be separated out. The leading components of the singularity can be generalized to apply to more general wing planforms. Author (GRA)

02 AIRCRAFT

Includes fixed-wing airplanes, helocopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N73-13008* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SYSTEM FOR STABILIZING TORQUE BETWEEN A BALLOON AND GONDOLA Patent
David K. Studenick, Allen L. Tyler, and Walter Squillari, inventors (to NASA) Issued 17 Oct. 1972 7 p Filed 24 Mar. 1971 Supersedes N72-11041 (10 - 02, p 0153)
(NASA-Case-GSC-11077-1; US-Patent-3,398,667; US-Patent-Appl-SN-127618; US-Patent-Class-244-32) Avail: US Patent Office CSCL 01C

A system for stabilizing torque between a balloon and a gondola suspended from the balloon is described. The balloon is connected to a stabilized gondola by a parachute having shroud lines. The top of the parachute is connected to the balloon by an active bearing having a motor driven in response to the output of a torque sensor connected between the shroud lines and the gondola. In response to the sensed torque above a certain level, pulses are applied to the active bearing to limit the torque buildup between the balloon and the gondola to a low value. Official Gazette of the U.S. Patent Office

N73-13009# National Research Council of Canada, Ottawa (Ontario).
A SUGGESTED METHOD FOR ESTIMATING PATCH LENGTH FROM TURBULENCE MEASUREMENTS USING RESULTS FROM LOW ALTITUDE FLIGHTS BY A T-33 AIRCRAFT
D. G. Gould and J. I. MacPherson Aug. 1972 26 p refs
(NRC-12793; LR-562) Avail: NTIS HC $3.50

When an aircraft encounters a patch of turbulence, the RMS turbulence intensity is usually constant only over a portion of the total period of exposure. A method is suggested for estimating the patch length as a function of intensity for turbulence encounters that have two or more regions of different turbulence intensities. It makes use of the fact that the amplitude or level crossing distributions that fall between the normal distribution and the exponential distribution may be closely approximated by a superposition of normal distributions of different intensities. Levels crossing distributions of vertical acceleration from a series of T-33 low altitude turbulence research flights are analyzed using this procedure, and results from flatland and hilly lakeland are compared. Author

N73-13010# La Plata Univ. (Argentina). Dept. of Aeronautical Engineering.
CALCULATING THE AERODYNAMIC DERIVATIVES OF A SUBSONIC AIRCRAFT AT HIGH VELOCITY [SOBRE EL CALCULO DE DERIVATIVAS AERODINAMICAS EN AVIONES SUBSONICOS DE ALTA VELOCIDAD]
Juan Pedro Weisz Mar. 1972 35 p refs In SPANISH
Avail: NTIS HC $3.75

A computer program in FORTRAN is presented for the IBM 360 computer for calculating wing loading on a subsonic wing at high velocity with low frequency oscillations. Subroutines are included for calculating the Multhopp influence, for deriving the functions of the influence for the oscillations, and aerodynamic coefficients. A separate program for calculating pressure distribution, and wing loading in a fixed regime is also included. Transl. by F.O.S.

N73-13011*# Lockheed-Georgia Co., Marietta.
PROGRAM FOR ESTABLISHING LONG-TIME FLIGHT SERVICE PERFORMANCE OF COMPOSITE MATERIALS IN THE CENTER WING STRUCTURE OF C-130 AIRCRAFT. PHASE 1: ADVANCED DEVELOPMENT
W. E. Harvill, A. O. Kays, E. C. Young, and W. M. McGee

[1972] 192 p
(Contract NAS1-11100)
(NASA-CR-112126) Avail: NTIS HC $11.75 CSCL 01B

Areas where selective reinforcement of conventional metallic structure can improve static strength/fatigue endurance at lower weight than would be possible if metal reinforcement were used are discussed. These advantages are now being demonstrated by design, fabrication, and tests of three boron-epoxy reinforced C-130E center wing boxes. This structural component was previously redesigned using an aluminum build-up to meet increased severity of fatigue loadings. Direct comparisons of relative structural weights, manufacturing costs, and producibility can therefore be obtained, and the long-time flight service performance of the composite reinforced structure can be evaluated against the wide background of metal reinforced structure. Author

N73-13012*# Scientific Translation Service, Santa Barbara, Calif.
LATEST CIVIL V/STOL AIRCRAFT PROJECTS OF HAWKER SIDDELEY AVIATION
T. K. Szlenkier Washington NASA Nov. 1972 27 p Transl. into ENGLISH from Flug-Rev. Int. (West Germany), no. 6, Jun. 1971 p 59-62 and 71-74
(Contract NASw-2035)
(NASA-TT-F-14619) Avail: NTIS HC $3.50 CSCL 01B

VTOL, RTOL and STOL projects are reviewed for the 1967-1971 time period. These include configurations with up to 16 fan-lift engines (HS 141-16). Operational characteristics and implications for air transport are discussed. Author

N73-13013*# Scientific Translation Service, Santa Barbara, Calif.
NUMERICAL PREDICTION OF THE DIFFUSION OF EXAUST PRODUCTS OF SUPERSONIC AIRCRAFT IN THE STRATOSPHERE
R. Joatton and A. Doury Washington NASA Nov. 1972 17 p refs Transl. into ENGLISH from l'Aeronautique et l'Astronautique (Paris), no. 36, 1972 p 37-44
(Contract NASw-2035)
(NASA-TT-F-14622) Avail: NTIS HC $3.00 CSCL 01B

The numerical prediction of the diffusion of exhaust products produced by supersonic aircraft during flight in the stratosphere is discussed. The diffusion of gaseous or finely scattered substances (nitrogen oxides, carbon monoxide, water vapor) which can become suspended in the stratosphere is evaluated. Numerical results are presented assuming three hundred supersonic jets, each making a return trip every day on a heavily traveled route. Author

N73-13014*# Scientific Translation Service, Santa Barbara, Calif.
A VORTEX MODEL FOR THE STUDY OF THE FLOW AT THE ROTOR BLADE OF A HELICOPTER
W. H. Isay Washington NASA Dec. 1972 45 p refs Transl. into ENGLISH from Z. Angew. Math. Mech. (East Germany), v. 52, Jun. 1972 p 283-309
(Contract NASw-2035)
(NASA-TT-F-14637) Avail: NTIS HC $4.25 CSCL 01B

On the base of unsteady vortex lifting line theory, an approximate method to calculate the loading distribution on rotor blades in forward flight is presented. The theory takes account of the vortex wake geometry for nonuniform flow through the rotor disc as well as the effect of rolling up and contraction of free tip- and root-vortices. Calculating the blade circulation distribution requires careful attention to the case where the blades pass through the rolled-up tip- and root-vortex of the foregoing foil. Author

N73-13015# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORTS, BRIEF FORMAT. SUPPLEMENTAL ISSUE: 1970 ACCIDENTS
21 Jul. 1972 113 p
(NTSB-BA-72-5) Avail: NTIS HC $7.75

Reports of aircraft accidents and incidents that occurred in 1970 and have not been included in a prior issue of briefs. Included are 9 U.S. Air Carrier Accidents, 82 U.S. Air Carrier incidents, 108 U.S. General Aviation accidents, and 39 U.S. General Aviation incidents. Five Foreign Air Carrier accidents, and 11 Foreign General Aviation accidents that were investigated by the National Transportation Safety Board are also included. This publication is the final issue of Briefs of Accidents that occurred in calendar year 1970. Author

N73-13016*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A WIND TUNNEL FLIGHT CORRELATION OF APOLLO 15 SONIC BOOM
Raymond M. Hicks, Joel P. Mendoza, and Frank Garcia, Jr. Jan. 1972 18 p refs
(NASA-TM-X-62111) Avail: NTIS HC $3.00 CSCL 20A

A correlation of sonic boom pressure signatures recorded during reentry of the Apollo 15 command module with wind-tunnel signatures extrapolated to flight distances has been made for Mach numbers of 1.16 and 4.57. The flight pressure signatures were recorded by pressure sensors located onboard ships positioned near the ground track while the wind-tunnel signatures were measured during tests of a 0.016-scale model of the command module. The agreement between estimates based on wind-tunnel data and flight measurements was better at Mach 4.57 than at Mach 1.16. Author

N73-13017# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORTS: BRIEF FORMAT US CIVIL AVIATION. ISSUE NUMBER 2: 1971 ACCIDENTS
8 Sep. 1972 481 p
(NTSB-BA-72-4) Avail: NTIS HC $26.25

Selected aircraft accident reports, in U.S. Civil Aviation operations during calendar year 1971. The 900 General Aviation accidents contained in this publication represent a random selection. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, kind of flying, injury index, aircraft damage, conditions of light, pilot certificate, injuries, and causal factors. Author

N73-13018# Advisory Group for Aerospace Research and Development, Paris (France).
AGARD FLIGHT MECHANICS PANEL SYMPOSIUM ON STABILITY AND CONTROL Technical Evaluation Report
William T. Hamilton (Boeing Co., Seattle) Oct. 1972 10 p refs Conf. held at Brunswick, 10-13 Apr. 1972
(AGARD-AR-48) Avail: NTIS HC $3.00

With the passing of time and better understanding of the aerodynamic and structural characteristics of aircraft configurations the opportunities to improve aircraft performance, reliability, or cost through the use of more sophisticated control systems was recognized. These advanced control systems involved additional disciplines such as complicated mechanisms, hydraulics, electronics, and new visual systems. Author

N73-13019# Advisory Group for Aerospace Research and Development, Paris (France).
A RELATION BETWEEN MEASURED CENTER OF GRAVITY VERTICAL ACCELERATIONS AND THE LOADS AT THE T-TAIL OF A MILITARY AIRPLANE
O. Buxbaum (Lab. fuer Betriebsfestigkeit, Darms-adt-Eberstadt, West Germany) Sep. 1972 20 p refs
(AGARD-597) Avail: NTIS HC $3.00

A method for the establishment of a statistical basis for the relations between center of gravity vertical accelerations and structural loads on a tailplane is described. The development and application of a fatigue meter for this purpose are discussed. Bending moments and load factors are plotted as graphs to show reliability of test procedures. Author

N73-13020*# North American Rockwell Corp., Columbus, Ohio. Aircraft Div.
FLIGHT TESTS OF A ROTATING CYLINDER FLAP ON A NORTH AMERICAN ROCKWELL YOV-10 AIRCRAFT
D. R. Cichy, J. W. Harris, and J. K. MacKay Washington NASA Nov. 1972 164 p refs
(Contract NAS2-5326)
(NASA-CR-2135) Avail: NTIS HC $3.00 CSCL 04B

Flight tests were conducted of a twin engine airplane modified to a STOL configuration with rotating cylinder flaps and interconnected propellers. The flight tests included verification

of the functional operation of the rotating cylinder flap system and the determination of the low speed flying qualities and performance characteristics with emphasis on approach and landing. Author

N73-13021*# Martin Marietta Corp., Denver, Colo.
BALLOON LAUNCHED DECELERATOR TEST PROGRAM: POST-TEST TEST REPORT
D. Dickinson, J. Schlemmer, F. Hicks, F. Michel, and R. D. Moog 11 Sep. 1972 198 p refs
(Contract NAS1-9000)
(NASA-CR-112176; TR-3720289) Avail: NTIS HC $12.00 CSCL 01B

Balloon Launched Decelerator Test (BLDT) flights were conducted during the summer of 1972 over the White Sands Missile Range. The purpose of these tests was to qualify the Viking disk-gap band parachute system behind a full-scale simulator of the Viking Entry Vehicle over the maximum range of entry conditions anticipated in the Viking '75 soft landing on Mars. Test concerns centered on the ability of a minimum weight parachute system to operate without structural damage in the turbulent wake of the blunt-body entry vehicle (140 deg, 11.5 diameter cone). This is the first known instance of parachute operation at supersonic speeds in the wake of such a large blunt body. The flight tests utilized the largest successful balloon-payload weight combination known to get to high altitude (120kft) where rocket engines were employed to boost the test vehicle to supersonic speeds and dynamic pressures simulating the range of conditions on Mars. Author

N73-13022*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
A STUDY OF THE VARIABLE IMPEDANCE SURFACE CONCEPT AS A MEANS FOR REDUCING NOISE FROM JET INTERACTION WITH DEPLOYED LIFT-AUGMENTING FLAPS
Richard E. Hayden, Yoram Kadman, and Robert C. Chanaud 15 Jul. 1972 107 p refs
(Contract NAS1-9559)
(NASA-CR-112166; Rept-2399) Avail: NTIS HC $7.50 CSCL 01B

The feasibility of quieting the externally-blown-flap (EBF) noise sources which are due to interaction of jet exhaust flow with deployed flaps was demonstrated on a 1/15-scale 3-flap EBF model. Sound field characteristics were measured and noise reduction fundamentals were reviewed in terms of source models. Test of the 1/15-scale model showed broadband noise reductions of up to 20 dB resulting from combination of variable impedance flap treatment and mesh grids placed in the jet flow upstream of the flaps. Steady-state lift, drag, and pitching moment were measured with and without noise reduction treatment. Author

N73-13023*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ACTIVE AIR CUSHION CONTROL SYSTEM MINIMIZING VERTICAL CUSHION RESPONSE Patent Application
Jack D. Leatherwood and David G. Stephens, inventors (to NASA) Filed 1 Nov. 1972 14 p
(NASA-Case-LAR-10531-1; US-Patent-Appl-SN-302720) Avail: NTIS HC $3.00 CSCL 01B

An active control system for an air cushion vehicle which reduces or eliminates the effects of excessive vertical vibratory acceleration and/or displacement is described. A typical air cushion vehicle with valves located in air supply ducts to regulate the air supply flow to air cushions under the control of transducers is illustrated. The system itself, including acceleration and position controllers, which process the output signals of transducers and whose outputs are summed by summing amplifier to produce a control signal for servo valve is analyzed. NASA

N73-13024*# Martin Marietta Corp., Denver, Colo.
BALLOON LAUNCHED DECELERATOR TEST PROGRAM, POST-TEST TEST REPORT. BLDT VEHICLE AV-4
D. Dickinson, J. Schlemmer, F. Hicks, and F. Michel 20 Oct. 1972 207 p refs
(Contract NAS1-9000; Proj. Viking 1975)
(NASA-CR-112179; TR-3720295) Avail: NTIS HC $12.50 CSCL 01B For Abstract See N73-13021

N73-13025*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXTRACTION OF LONGITUDINAL AERODYNAMIC COEFFICIENTS FROM FORWARD-FLIGHT CONDITIONS OF A TILT-WING V/STOL AIRPLANE
James L. Williams Washington Dec. 1972 24 p refs
(NASA-TN-D-7114; L-8301) Avail: NTIS HC $3.00 CSCL 01B

A parameter-estimation algorithm was used to extract the longitudinal aerodynamic derivatives from flight data for the XC-142A airplane in a cruise condition. The flight data were the response to a tail-plane doublet input. Results of this study showed that a set of derivatives were determined which yielded a calculated aircraft response in close agreement with the measured response. This calculated response was in much closer agreement with the flight data than the response obtained by using derivatives which were calculated from empirical methods. There were large differences between some of the important derivatives extracted from flight data and those calculated from empirical methods. The reasons for these differences were not identified. Author

N73-13026*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOISE GENERATED BY IMPINGEMENT OF A JET UPON A LARGE FLAT BOARD
William A. Olsen, Jeffrey H. Miles, and Robert G. Dorsch Washington Dec. 1972 35 p refs
(NASA-TN-D-7075; E-6983) Avail: NTIS HC $3.00 CSCL 01B

Data were obtained on the noise generated by an air jet impinging on a large flat board. The board was large enough so that the flow leaving the edges of the board generated no significant noise. The impingement angle, nozzle shape and size, jet velocity, and the distance from the nozzle to the board were varied in the experiment. Far-field noise data are presented. The nozzle-alone noise contribution to the total noise was generally small and was subtracted from the total, leaving the impingement-only noise. The impingement-only noise was adequately correlated by eighth power of the peak impingement velocity and first power of the impingement area. The spectral data were correlated by a Strouhal number based on the peak impingement velocity and a characteristic impingement diameter. Author

N73-13027*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SOME LOADING CONDITIONS IMPOSED BY GROUND TURNING MANEUVERS WITH THREE JET TRANSPORT AIRPLANES
Albert W. Hall Washington Dec. 1972 29 p refs
(NASA-TN-D-7132; L-8597) Avail: NTIS HC $3.00 CSCL 01B

Some loading conditions imposed during ground turning maneuvers are presented for arrival and departure operations at several airports with C-141A, 727, and DC-9 airplanes. The data presented for a total of 809 turns include: ground speed, lateral acceleration, the number of turns required during arrival and departure, and the magnitude of the turns. Author

N73-13028*# Boeing Co., Philadelphia, Pa. Vertol Div.
THEORY/TEST CORRELATION OF HELICOPTER ROTOR BLADE ELEMENT AIRLOADS IN THE BLADE STALL REGIME
Christopher J. Bobo Aug. 1972 50 p refs
(Contract NAS2-5473)
(NASA-CR-114489; D210-10508-1) Avail: NTIS HC $4.50 CSCL 01B

The effects of stall on a rotor blade element in a three-dimensional rotating environment was investigated. The model rotor test provided blade element airloads and local boundary layer flow characteristics at the three-quarter blade radius position for a wide range of rotor operating conditions. A description of the test program and the test results are presented. Author

N73-13029*# Techtran Corp., Glen Burnie, Md.
UTILIZATION OF VARIATIONAL METHODS IN THE

CALCULATION OF ROTOR BLADES AND PROPELLER VIBRATIONS

Yu. S. Vorobyev and P. P. Gontarovskiy Washington NASA Dec. 1972 10 p refs Transl. into ENGLISH from Dinamika i Prochnost Mashin (USSR), no. 14 p 37-43
(Contract NASw-2037)
(NASA-TT-F-14627) Avail: NTIS HC $3.00 CSCL 20K

Relations for the torsional-bending and longitudinal vibrations of rotating shafts are applied to the determination (by a variational method) of the free vibrations of individual rotor blades, the in-phase vibrations of blade cascades, and the vibrations of shrouded blades. The critical flutter speed of a propeller is also determined. The influence of various factors on the frequencies, mode shapes, and stresses of rotor blades is studied on the basis of computer calculations. It is shown that, depending on the shaft geometry, Coriolis forces can increase and decease the critical flutter speed. Author

N73-13030# National Aviation Facilities Experimental Center, Atlantic City, N.J.

DEVELOPMENT OF LOW-COST COCKPIT/OUTSIDE TIME SHARING TRAINING EQUIPMENT Final Report, Sep. 1971 - Jul. 1972

Warren G. Crook Nov. 1972 20 p refs
(FAA-RD-72-95; FAA-NA-72-61) Avail: NTIS HC $3.00

Time-sharing training using a low-cost visual in-cockpit device is discussed. Training sessions in a ground trainer with subsequent flight checks in an airplane showed marked improvement in cockpit/outside visual scanning and piloting proficiency. Pilots expressed favorable comments regarding use of the concept for student pilot training. Three pilot training schools also evaluated an in-cockpit aural signal device designed to prompt pilots to scan outside for other aircraft. The device received unfavorable comments from student pilots and flight instructors due to excessive amounts of annoyance and distraction, and was not recommended as a training aid. Author

N73-13031# Technische Hochschule, Aachen (West Germany). Inst. fuer Luft- und Raumfahrt.

ACOUSTIC FEEDBACK PHENOMENA OF THE SUBSONIC AND HYPERSONIC FREE JET IMPINGING ON A FOREIGN BODY [AKUSTISCHE RUECKKOPPLUNGSERSHEINUNGEN AM UNTER- UND UEBERSCHALLFREISTRAHL, DER AUF EINEN STOERKOERPER TRIFFT]

G. Neuwerth Sep. 1972 30 p refs In GERMAN; ENGLISH summary Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-84) Avail: NTIS HC $3.50

The acoustic feedback phenomena associated with the impingement of a free subsonic or supersonic jet on an obstacle, for example blown flaps, or for the ground (VTOL), are investigated. In the noise spectrum of an under-expanded jet there are discrete screech frequencies generated by feedback between the flow and the pressure field generated by it. But when a choked jet impinges on an obstacle it was found that this becomes the dominant sound source when there are less than 5 cells of the jet between the nozzle exit and the obstacle. The feedback mechanism for this case was investigated and the discrete frequencies were determined as a function of distance between nozzle and obstacle, nozzle diameter and the nozzle pressure ratio. The appearance of two different vortex modes is explained. Possibilities to destroy the feedback and to reduce the noise are given. Author (ESRO)

N73-13032# Technische Univ., Berlin (West Germany). Inst. fuer Technische Akustik.

SOUND GENERATION IN A TURBULENT FREE JET WITH AN ELASTIC PLATE AS FOREIGN BODY [SCHALLERZEUGUNG BEI EINER ELASTISCHEN PLATTE ALS STOERKOERPER IN EINEM TURBULENTEN FREISTRAHL]

W. Boehnke 1972 9 p refs In GERMAN Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-85) Avail: NTIS HC $3.00

Measurements are presented of sound generated by the impingement of a turbulent jet on elastic plates. It is found that for sufficiently large plates the acoustic radiation increases when the distance between plate and jet nozzle is less than 15 nozzle diameters. Sound can be generated by means of easily vibrating plates, which diminished with increasing flow velocity due to deflection and reflection. Author (ESRO)

N73-13033# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Aeroelastik.

INVESTIGATION OF UNSTEADY INTERFERENCE EFFECTS ON A HARMONICALLY OSCILLATING WING-TAILPLANE MODEL WITH VARIABLE SWEEPBACK IN THE LOW SUBSONIC RANGE [UNTERSUCHUNG INSTATIONAERER INTERFERENZEFFEKTE AN EINEM HARMONISCH SCHWINGENDEN FLUEGEL-HOEHENLEITWERKS-MODELL MIT VARIABLER FLUEGELPFEILUNG IM NIEDRIGEN UNTERSCHALLBEREICH]

H. Triebstein and J. Becker (Messerschmitt-Boelkow-Blohm G.m.b.H., Munich) Dec. 1971 49 p refs In GERMAN; ENGLISH summary Presented at the 4th DGLR Ann. Meeting, Baden-Baden, West Ger., 11-13 Oct. 1971
(DLR-FB-71-52; AVA-FB-7130) Avail: NTIS HC $4.50; DFVLR, Porz, West Ger.: 15 DM

The results of pressure measurements on harmonically oscillating wing-tailplane configurations in the incompressible speed range are presented. The model used consists of a variable sweep wing and a horizontal stabilizer. Special emphasis is given to the unsteady aerodynamic interfering effects on various wing-tailplane configurations. In particular, the effects of the wing sweep-back, the wing angle of attack and the V-position of the tailplane stabilizer are investigated in detail for several reduced frequencies and longitudinal positions of the wing and tailplane. Author (ESRO)

N73-13034# Aeroplane and Armament Experimental Establishment, Boscombe Down (England). Engineering Div.

ANDOVER C. Mk1 AIRFIELD CRITERIA TRIALS

J. Howell London Aeron. Res. Council 1972 87 p refs Supersedes ARC-31190
(ARC-CP-1220; ARC-31190) Avail: NTIS HC $6.50; HMSO £1.35; PHI $5.30

The Andover C Mk.1 short takeoff transport aircraft was tested on various types and conditions of soils and surfaces used as landing sites. It was concluded that the aircraft can be operated without excessive damage from natural and semiprepared surfaces subject to certain specified limitations. On smooth surfaces of adequate bearing strength, operation can proceed with existing specifications. On rough surfaces takeoff and landing weights are restricted. Loose surface materials are acceptable subject to performance considerations (6 inches depth when dry, 8 inches depth when wet) provided that the sub-grade bearing strength at these depths is adequate. Author (ESRO)

N73-13035# Army Foreign Science and Technology Center, Charlottesville, Va.

HELICOPTER DESIGN

V. N. Dalin 1972 316 p refs Transl. into ENGLISH of the book "Konstruktsiya Vertoketiv" Moscow, Mashinostroyeniye, 1971
(AD-748751; FSTC-HT-23-1472-72) Avail: NTIS CSCL 01/3

This book presents diagrams of helicopters, design, kinematic and power diagrams of the basic components of domestic series-produced helicopters, general data on the process of designing a helicopter and necessary information from the history of helicopter construction development. Author (GRA)

N73-13036# Army Research Office, Durham, N.C.

HELICOPTER NOISE SYMPOSIUM

Sep. 1971 164 p refs Conf. held at Durham, N. C., 28-30 Sep. 1971
(AD-748876; AROD-9164-1-E) Avail: NTIS CSCL 01/3

A symposium in which recognized experts in the helicopter noise field participated was organized. Primary researchers from ten ARO-D-sponsored contracts and five other groups presented papers on the subject of helicopter noise. In addition, helicopter noise research at two U.S. Army Air Mobility R and D Laboratories (AAMRDL), at NASA Langley Research Center, and at the Office of the Chief of Research and Development (OCRD) was discussed. The report includes all formal papers presented at the Helicopter Noise Symposium held in Durham, North Carolina, on September 29-30, 1971. Author (GRA)

N73-13037# Applied Behavioral Sciences, Inc., New Castle, Del.
A SYSTEM OF COMPUTER AIDED TROUBLESHOOTING
Walter A. Jablonski, Frank Barclay, and Gerald OBrien Oct. 1971 22 p refs
(AD-748665; ABS-TR-1-71) Avail: NTIS CSCL 01/3

A study was conducted to determine the feasibility of a computer assisted troubleshooting system. The researchers developed a fully proceduralized computer program which was capable of guiding a maintenance technician to the source of an equipment malfunction. The CATS equipment included a cathode ray input/output device, a Univac 1108 computer, and a microfiche viewer. The computer terminal provided step by step guidance, while at the same time, the microfiche viewer provided visual information concerning location, removal, and replacement of components, lists of special tools and materials, and special test procedures. The results of the study indicated that existing computer technology can be used for a fully proceduralized computer assisted troubleshooting system. Preliminary tests showed that the artwork and program concepts were feasible, workable, and sound. Author (GRA)

N73-13038# Army Materials and Mechanics Research Center, Watertown, Mass.
RESPONSE OF ROTOR BLADES TO RANDOM INPUTS. PART 2: COMBINED BENDING AND TORSION
Chatta Lakshmikantham and Chintakindi V. Joga Rao May 1972 15 p refs
(DA Proj. 1T0-61102-B-33A)
(AD-746627; AMMRC-TR-72-15-Pt-2) Avail: NTIS CSCL 01/3

The response of a flexible helicopter rotor blade to random loading is investigated, the random input being the vertical velocity component. The model takes into account blade flexibility in bending as well as torsion, and also general rotor-end fixity. The spectral density and the mean square value of the transverse displacement are computed for both hingeless and hinged rotor blades and the results are evaluated. Author (GRA)

N73-13039# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE MINIMUM TIME TO TURN PROBLEM FOR A HIGH THRUST TO WEIGHT RATIO AIRCRAFT M.S. Thesis
Larry J. Roach Jun. 1972 69 p refs
(AD-748354; GAW/MC/72-14) Avail: NTIS CSCL 01/2

Optimal control theory is used to determine open-loop control laws for thrust, coefficient of lift, and bank angle for minimum time maneuvers for high thrust-to-weight ratio aircraft. In obtaining these control laws, an aircraft mathematical model is used which includes constraints on thrust, coefficient of lift, and on the aircraft load factor. Numerical results are discussed for two maneuver problems which are stated as minimum-time turns from specified initial conditions to the following terminal conditions: only heading angle specified, and heading angle and velocity specified.
Author (GRA)

N73-13040# Southwest Research Inst., San Antonio, Tex.
THE RESPONSE OF A MODEL HELICOPTER ROTOR BLADE TO RANDOM EXCITATION DURING FORWARD FLIGHT Final Report, 18 May 1965 - 17 Aug. 1972
Daniel D. Kana and Wen-Hwa Chu 15 Aug. 1972 55 p refs
(Contract DA-31-124-ARO(D)-375)
(AD-748457; AROD-55988-5) Avail: NTIS CSCL 01/3

The response of a model helicopter rotor blade to random excitation while in simulated forward flight is studied analytically and experimentally by means of an electromechanical apparatus. Complex transfer functions are defined which relate steady-state responses in bending, flapping, and torsion modes to a sine input. Responses occur at the input and side-band frequencies. These transfer functions are then used along with excitation power spectra to predict the nonstationary time-averaged power spectrum of the response. Validity of the transfer function analysis is investigated by means of the electromechanical model which includes analog computer simulation of the interaction of blade deflections and aerodynamic load. Author (GRA)

N73-13041# Illinois Univ., Savoy. Aviation Research Lab.
DEVELOPMENT AND EVALUATION OF A FLIGHT DIRECTOR SYSTEM FOR INSTRUMENT LANDINGS
Joe A. Lamb May 1972 63 p refs
(Contract F44620-70-C-0105)
(AD-748244; ARL-72-11/AFOSR-72-6; AFOSR-72-1661TR)
Avail: NTIS CSCL 01/4

The research evaluates comparatively, in a simulated instrument landing system, four different configurations of a flight director display using command heading and command flight path angle. The four configurations include moving horizon display, moving aircraft display, frequency-separated display, and kinalog display. ILS localizer tracking performance with any of the experimental displays was superior to that with the conventional cross-pointer flight-path display. Author (GRA)

N73-13042# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
EVALUATION OF LATERAL-DIRECTIONAL HANDLING QUALITIES AND ROLL-SIDESLIP COUPLING OF FIGHTER CLASS AIRPLANES Final Report
Edward M. Boothe and Michael L. Parrag May 1972 151 p refs
(Contract F33615-71-C-1240)
(AD-748435; CAL-BM-3053-F-2-Vol-1;
AFFDL-TR-72-36-Vol-1) Avail: NTIS CSCL 01/3

Lateral-directional handling qualities for Class 4 airplanes in Flight Phase Category A were investigated in the USAF/CAL variable stability NT-33A airplane. The primary purpose was to extend the data base for roll-sideslip coupling requirements specified by MIL-F-8785B (ASG) for this class of airplanes. Other purposes included evaluation of the minimum Dutch roll frequency and damping requirements of MIL-F-8785B (ASG) for Class 4 airplanes in Flight Phase Category A and an investigation of the applicability of MIL-F-83300 roll-sideslip requirements to airplanes in high speed flight conditions. Author (GRA)

N73-13043# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AIRCRAFT CONSTRUCTION TECHNOLOGY
A. L. Abibov and N. M. Biryukov 12 May 1972 1038 p refs
Transl. into ENGLISH of the book "Tekhnologiya Samoletostroeniya" Moscow, Izd-vo Mashinostroyeniye, 1970 p 1-599
(AD-748712; FTD-MT-24-1515-71) Avail: NTIS CSCL 01/3

The book presents the theoretical bases of the technology of aircraft construction and describes the various technological processes in the manufacture of components, the assembly from them of units, panels, subassemblies and the entire aircraft (helicopter) as a whole, the application of protective coatings, the installation of systems and equipment, the tests, employed in series production. The principles of structuring technological processes, the methods and means of ensuring high quality, reliability and the required service life of products are presented.
Author (GRA)

N73-13044# Army Foreign Science and Technology Center, Charlottesville, Va.
TECHNOLOGY OF AIRCRAFT CONSTRUCTION
A. L. Abibov et al 21 Aug. 1972 77 p Transl. into ENGLISH from the publ. "Tekhnologiya Sanoletostroyeniya" Moscow, Mashinostr., 1970 Chapters 13, 23, 27
(AD-749558; FSTC-HT-23-1302-72) Avail: NTIS CSCL 01/3

The document consists of three chapters of a monograph. Chapter 13 discusses the manufacture of parts of plastics, ceramic and metal ceramics used in aircraft construction. Chapter 23 presents details on manufacture and assembly of sections and aggregates of nonmetallic materials. Chapter 27 describes the general assembly and testing of aircraft (helicopters).
Author (GRA)

N73-13045# Naval Ordnance Lab., White Oak, Md.
EFFECTS OF CANOPY GEOMETRY ON THE SPINNING CHARACTERISTICS OF A CROSS PARACHUTE WITH A W/L RATIO OF 0.264
William P. Ludtke 20 Jun. 1972 48 p
(AD-749010; NOLTR-72-145) Avail: NTIS CSCL 01/3

The effects of cloth permeability, number of suspension lines, suspension line length, and hem configuration on the spinning characteristics and aerodynamic drag force of the cross parachute were investigated in a wind tunnel. Forty-inch-diameter models with a canopy arm width-to-length ratio (W/L) of 0.264 were

tested at various velocities from 50 feet per second to 300 feet per second. Tests were conducted with a conventional cross parachute and with modifications to the skirt hem which represented an interpanel cord and a band of cloth. The width of the cloth band was ten percent of the canopy diameter.
Author (GRA)

N73-13046# Collins Radio Co., Cedar Rapids, Iowa.
YAW AXIS CONTROL AS A MEANS OF IMPROVING V/STOL AIRCRAFT PERFORMANCE
James A. Klein Wright-Patterson AFB, Ohio AFFDL 18 Sep. 1972 44 p
(Contract F33615-72-C-1793; AF Proj. 643A)
(AD-749489; AFFDL-TR-72-99) Avail: NTIS CSCL 01/3
Cross coupling between the yaw axis and other control inputs of a V/STOL aircraft limits its performance capabilities. Yaw control augmentation was investigated as a means to reduce the cross coupling effects. Using the CH-3 helicopter as an example of V/STOL aircraft, this report defines yaw damping, turn coordination and heading hold control laws that can be used for yaw control augmentation. Improved vehicle performance is achieved by using the recommended control laws in a yaw control system. Author (GRA)

N73-13047# Naval Weapons Lab., Dahlgren, Va.
ANGULAR MOMENTUM AND THE AIRCRAFT-STORE SEPARATION PROBLEM
P. Daniels and T. A. Clare Apr. 1972 16 p refs
(AD-749027; NWL-TR-2721) Avail: NTIS CSCL 01/3
The stability criterion of a missile containing an internal spinning fly wheel is derived and the effect of this fly wheel on the missile's launch disturbance is explained. Author (GRA)

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N73-13048# Lockheed Missiles and Space Co., Palo Alto, Calif.
NEW DIRECTIONS IN PHOTOELECTRIC POWER
A. M. Vasilev and A. P. Landsman [1972] 5 p refs Transl. into ENGLISH from the book "Polvprovodnikovye Fotopreobrazovateli" Sovetskoe Radio, Moscow, 1971 p 206-219
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616 CSCL 10A
Procedures for reducing the weight and cost of solar batteries are discussed. The use of CdS and CdTe photoelectric converters is recommended. The construction of the photocells is illustrated. Mathematical models and graphs are included to show efficiencies of operation. Author

N73-13049*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROGRESS IN ELECTROCHEMICAL STORAGE FOR BATTERY SYSTEMS
Floyd E. Ford, Thomas J. Hennigan, Charles F. Palandati, and Ernst Cohn Sep. 1972 13 p refs
(NASA-TM-X-66129; X-761-72-448) Avail: NTIS HC $3.00 CSCL 10C
Efforts to improve electrochemical systems for space use relate to: (1) improvement of conventional systems; (2) development of fuel cells to practical power systems; and (3) a search for new systems that provide gains in energy density but offer comparable life and performance as conventional systems. Improvements in sealed conventional systems resulted in the areas of materials, charge control methods, cell operations and battery control, and specific process controls required during cell manufacture. Fuel-cell systems have been developed for spacecraft but the use of these power plants is limited. For present and planned flights, nickel-cadmium, silver-zinc, and silver-cadmium systems will be used. Improvements in nickel-cadmium batteries have been applied in medical and commercial areas. Author

N73-13050*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RESULTS OF THE 1970 BALLOON FLIGHT SOLAR CELL STANDARDIZATION PROGRAM
Richard F. Greenwood 1 Dec. 1972 21 p refs
(Contract NAS7-100)
(NASA-CR-129794; JPL-TR-32-1575) Avail: NTIS HC $3.25 CSCL 10A
For the eighth consecutive year, high-altitude calibration of solar cells was accomplished with the aid of free-flight balloons. Flights were conducted to an altitude of 36,576 m which is above 99.5% of earth's atmosphere where all water vapor levels and significant ozone bands are absent. Solar cells calibrated in this manner are significant used as intensity references in solar simulators and in terrestrial sunlight. Discussed is the method employed for high altitude balloon flight solar cell calibration. Also presented are data collected on 52 standard solar cells on two flights conducted in 1970. Solar cells flown repeatedly on successive flights have shown correlation of better than + or - 1.0%. Author

N73-13051*# Heliotek, Sylmar, Calif.
DESIGN AND FABRICATION OF WRAPAROUND CONTACT SILICON SOLAR CELLS
J. A. Scott-Monck, P. M. Stella, and J. E. Avery Nov. 1972 30 p refs
(Contract NAS3-15344)
(NASA-CR-121021) Avail: NTIS HC $3.50 CSCL 10A
Both dielectric insulation and etched junction contact techniques were evaluated for use in wraparound contact cell fabrication. Since a suitable process for depositing the dielectrics was not achieved, the latter approach was taken. The relationship between loss of back contact and power degradation due to increased series resistance was established and used to design a simple contact configuration for 10 ohm-cm etched wraparound junction contact N/P cells. A slightly deeper junction significantly improved cell curve shape and the associated loss of current was regained by using thinner contact grid fingers. One thousand cells with efficiencies greater than 10.5% were fabricated to demonstrate the process. Author

N73-13052*# General Electric Co., Lynn, Mass. Direct Energy Conversion Programs.
DEVELOPMENT OF A SOLID POLYMER ELECTROLYTE ELECTROLYSIS CELL MODULE AND ANCILLARY COMPONENTS FOR A BREADBOARD WATER ELECTROLYSIS SYSTEM
F. J. Porter, Jr. Aug. 1972 124 p
(Contract NAS1-9750)
(NASA-CR-112183) Avail: NTIS HC $8.25 CSCL 10A
Solid polymer electrolyte technology in a water electrolysis system along with ancillary components to generate oxygen and hydrogen for a manned space station application is considered. Standard commercial components are utilized wherever possible. Presented are the results of investigations, surveys, tests, conclusions and recommendations for future development efforts. Author

N73-13053# Giessen Univ. (West Germany). Inst. fuer Physik.
STUDY ON THE LEAK RATE OF ESRO 4 Ni/Cd BATTERY CELLS Summary Report, Apr. - Jun. 1972
R. Grasser and A. Scharmann 20 Jun. 1972 59 p
(Contract ESTEC-1599/72/JS)
(ESRO-CR(P)-132; ESRO-CR(P)-133) Avail: NTIS HC $5.00
A study of ESRO 4 NiCd battery leakage under different operating conditions was performed by gas analysis. For this purpose a special apparatus had to be constructed and is described. The experimental results of the electrical, mass analyzing and pressure use measurements are presented and it is concluded that H2O and KOH are the main outgassing constituents. A simple method for the determination of the KOH leak rates of battery cells is proposed. Author (ESRO)

N73-13054# Giessen Univ. (West Germany). Inst. fuer Physik.
STUDY ON LEAK RATE OF ESRO 4 Ni/Cd BATTERY CELLS Summary Report, Jul. - Aug. 1972
R. Grasser and A. Scharmann 10 Aug. 1972 12 p
(Contract ESTEC-1599/72/SL)
(ESRO-CR(P)-132; ESRO-CR(P)-133-Add-1) Avail: NTIS HC

$3.00
The KOH loss of ESRO 4 NiCd battery cells by means of electrical measurements is discussed. A simplified version of the theory of electrolytic conductivity which is used for the measurements is given and the experimental set-up and procedure are described. The KOH loss of the battery cells versus time is presented in a graph. Author (ESRO)

N73-13055# Eagle-Picher Industries, Inc., Joplin, Mo. Couples Dept.
SEALED NICKEL-CADMIUM BATTERY ASSEMBLY BB-553( )/U Final Report, Jan. 1970 - Apr. 1972
William C. Harsch and Dale V. Gordon Aug. 1972 90 p refs
(Contract DAAB07-70-C-0168; DA Proj. 1T6-62705-A-053)
(AD-748454; ECOM-0168-F) Avail: NTIS CSCL 10/3

The BB-553( )/U nickel-cadmium storage battery assembly was developed to provide a portable D.C. power supply for use with electronically controlled man-pack equipment. The report contains the test results and a brief design description. The BB-553( )/U battery assembly is a rechargeable, hermetically-sealed, sintered plate nickel-cadmium storage battery. The battery assembly has a military-ruggedized design and consists of 20 individual, series-connected cells provided with a pressure sensing charge control circuit. Author (GRA)

N73-13056# Army Foreign Science and Technology Center, Charlottesville, Va.
FUEL CELLS AND PROSPECTS FOR THEIR USE IN RAILROAD TRANSPORTATION
V. M. Anisimov 13 Jul. 1972 74 p refs Transl. into ENGLISH of the book "Toplivn. Elementy i Perspekt. Primeneniya ikh na Zheleznodorozhnom Transp." Moscow, Izd. Transp., 1971
(AD-747512; FSTC-HT-23-960-72) Avail: NTIS CSCL 10/2

The principles of the direct conversion of chemical energy into electrical energy are examined. Different types of fuel cells are described and existing power plants and power plants with fuel cells are compared. Author (GRA)

N73-13057# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SELECTION OF OPTIMAL CONDITIONS AT THE CHANNEL INLET ON AN MHD GENERATOR
K. Donskoi, Yu. Dunaev, E. Nazarov, and I. Shakhnov 28 Jun. 1972 11 p refs Transl. into ENGLISH from Magn. Gidrodin. (USSR), v. 6, no. 4, 1970 p 101-105
(FTD Proj. 314562)
(AD-748750; FTD-HC-23-0957-72) Avail: NTIS CSCL 10/2

Analysis of the optimal inlet parameters for an MHD channel employing combustion products of kerosene and gaseous oxygen. The analysis is performed for an ideally sectioned channel and for a channel with solid electrodes of finite length. It is shown that at low chamber pressures, the optimum inlet pressure for the sectioned channel is lower by an order of magnitude than that for the channel with solid electrodes. This difference decreases with increasing chamber pressures. A chamber pressure of roughly 2 atm abs is optimal for maximum power, while a pressure of 18 atm abs is optimum for specific volumetric power.
Author (GRA)

N73-13058# Yardney Electric Corp., Pawcatuck, Conn.
NEW MECHANICALLY RECHARGEABLE ZINC/AIR BATTERY DESIGN Interim Technical Report, 1 Nov. 1971 - 1 Feb. 1972
Roland F. Chireau and Ronald G. Gunther Jun. 1972 41 p
(Contract DAAB07-71-C-0333; DA Proj. 1T6-62705-A-053)
(AD-748455; ECOM-0333-2; ITR-2) Avail: NTIS CSCL 10/3

Twenty ampere-hour and 32 ampere-hour Zinc/Air cells were tested on the PRC-70 radio high rate regimen using air flow achieved by natural convection and by means of a blower. Performance data are presented for both cell types. Research on the Yardney platinum catalyzed air electrodes is given. The results of endurance tests on air cathodes are summarized. The effect of expanders and additives on the zinc anode performance was investigated. A BA-525 Zinc/Air Battery (20 cells, 20 AH) engineering prototype was fabricated in order to evaluate the capability of the system on the PRC-70 radio test regimen. GRA

N73-13059# Energy Research Corp., Bethel, Conn.
INEXPENSIVE CATHODE CATALYSTS Final Technical Report, 31 Mar. 1971 - 31 Mar. 1972
Ralph N. Camp and Bernard S. Baker 14 Jul. 1972 75 p refs
(Contract DAAK02-71-C-0302; DA Proj. 1T6-61102-A-34A)
(AD-748447; ERC-6712F) Avail: NTIS CSCL 10/2

The report is a summation of the findings and developments aimed at the development of a low cost air cathode. The purpose was to lower the cost of air breathing fuel cells having moderate (125-135C) temperature phosphoric acid as the electrolyte. A new type of particulate graphite substrate was developed to replace metal grid support structures. A 2 mg/sq cm cathode containing small amounts of graphite and supported on a graphite substrate represents a total cathode cost of $167/Kw based on performance after 500 hours of testing at 100 mA/sq cm.
GRA

N73-13060# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE THERMODYNAMICS OF SYSTEMS FOR DIRECT TRANSFORMATION OF THERMAL ENERGY INTO ELECTRICAL, PART 2
V. A. Grodko and B. N. Markaryan 19 May 1972 25 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR Energ. Transp. (USSR), no. 3, 1971 p 107-116
(AD-747618; FTD-MT-24-1749-71-Pt-2) Avail: NTIS CSCL 10/1

The authors examined the ideal thermodynamic cycle of a system for direct transformation of thermal energy into electrical, with consideration of the simultaneity of the change in temperature and potential in the branches of the system. For these conditions the authors have obtained equations of the volt-ampere characteristics. The question of the connection between the thermoelectric coefficients was also examined. Generalized correlations were obtained between the Peltier and Thomson thermoelectromotive force coefficients. It has been shown that the presently accepted representation of the coefficient of thermoelectromotive force is not universal. Author (GRA)

N73-13061# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PRINCIPLES OF THERMOELECTRONIC AND MAGNETOHYDRODYNAMIC CONVERSION OF ENERGY
K. M. Arefev and I. I. Pakev 2 Jun. 1972 306 p refs Transl. into ENGLISH from the monograph "Osnovy Termoelektronnogo i Magnitogidrodinamicheskogo Preobrazovaniya energii" Moscow, 1970 p 1-215
(AD-748707; FTD-MT-24-1464-71) Avail: NTIS CSCL 10/2

The report deals with the basic physical processes in thermionic and magnetohydrodynamic converters of thermal energy into electrical energy. Data on the operation of the converters are given. The book is intended for engineers and can be used as a textbook by students of technical colleges.
Author (GRA)

N73-13062# Energy Research Corp., Bethel, Conn.
SEALED NICKEL-ZINC RECHARGEABLE BATTERIES Final Report, 31 Mar. 1971 - 30 Mar. 1972
Allen Charkey Jul. 1972 39 p
(Contract DAAB07-71-C-0134; DA Proj. 1T6-62705-A-053)
(AD-748896; ECOM-0134-F) Avail: NTIS CSCL 10/3

Data are presented which show that high energy sealed nickel-zinc cells are at present capable of over 300 maintenance free cycles at 62% depth of discharge. Energy densities range from 25 - 30 Wh/lb at rates of discharge of 3C to C/4. Improved inorganic separators (ERC-2001) are discussed which contain a metallic layer hydroxide in combination with 20% by weight Teflon binder. These separators are ultra-thin, can easily be folded, and maintain their physical integrity during cycling. The rate of oxygen recombination in sealed cells has been improved through the use of silver-mercury recombination electrodes. Dissection of a representative cell with 2001 separators after 315 cycles showed that no zinc was present in the separators, negative electrode shape change was 32% and the positive electrodes had increased an average 20% in thickness. GRA

N73-13063# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF PLANAR PIN THERMOPHOTOVOLTAIC CELLS Final Report, 1 Jun. 1971 - 1 Jun. 1972
Richard J. Schwartz and N. F. Gardner Aug. 1972 104 p refs
(Contract DAAB07-70-C-0129)
(AD-748895; ECOM-0129-F; FR-2) Avail: NTIS CSCL 10/2

The results of calculations of the performance of a planar P-I-N thermophotovoltaic cell are reported. A computer program has been written which automatically optimizes the cell geometry. The program allows the bulk recombination rate, the surface recombination velocity, the hole and electron mobilities and the intensity and spectrum of radiation illuminating the cell to be chosen arbitrarily. The performance of germanium P-I-N cells is investigated for monochromatic radiation and radiation from 1873 K erbium oxide and black body sources. Experimental work leading to the fabrication of interdigitated P-I-N thermophotovoltaic cells is described. The results of tests evaluating the performance of fabricated cells are discussed. A series of experiments were carried out to determine why the performance of these cells was below theoretical expectations. Author (GRA)

N73-13064# Yardney Electric Corp., Pawcatuck, Conn.
NEW MECHANICALLY RECHARGEABLE ZINC/AIR BATTERY DESIGN Interim Technical Report, 1 Jul. - 1 Nov. 1971
Roland F. Chireau and Ronald G. Gunther Apr. 1972 51 p
(Contract DAAB07-71-C-0333; DA Proj. 1T6-62705-A-053)
(AD-748434; Rept-1449-72; ECOM-0333-1; ITR-1) Avail: NTIS CSCL 10/3

Performance characteristics of the Yardney 20 AH Zinc/Air mechanically rechargeable systems are discussed in the light of the high power output requirements of the Technical Guidelines. Several design changes and improvements were incorporated into the bicell cathode-frame sealing interface. The performance characteristics of Zinc/Air cell stacks with and without forced air blowers were investigated. Air electrodes with low loadings of Pt black were fabricated and tested for polarization behavior at high rates. It is shown that mix formulations containing commercially available zinc powder can meet the high rate output required. GRA

N73-13065# Battelle Columbus Labs., Ohio.
RATE OF DISCHARGE OF ACCELERATED LIFE TESTS OF NICKEL-CADMIUM CELLS
John McCallum, Earl A. Roeger, Jr., and Gerald H. Miller Aug. 1972 50 p refs
(Contract F33615-69-C-1537; AF Proj. 3145)
(AD-748253; AFAPL-TR-72-67) Avail: NTIS CSCL 10/3

Special demountable cells were designed, constructed, and tested with rates of discharge as the primary independent variable. Duplicate experiments were performed with groups of five demountable cells. Separate groups were discharged at C/2, C, 2C, 4C, and 8C rates. One experiment maintained uniform temperatures of about -25C in all cells. The other experiment had an environmental temperature of -25C, but internal heaters were maintained at -40C. Otherwise, all known variables were held constant. Both groups of cells degraded at a higher rate in measured qualities at higher rates of discharge. Results are discussed. GRA

N73-13066# Battelle Columbus Labs., Ohio.
TEMPERATURE AND TEMPERATURE GRADIENTS FOR ACCELERATED LIFE TESTS OF NICKEL-CADMIUM CELLS
E. W. Brooman, J. McCallum, E. A. Roeger, Jr., and G. H. Miller Aug. 1972 81 p refs
(Contract F33615-69-C-1537; AF Proj. 3145)
(AD-748252; AFAPL-TR-72-66) Avail: NTIS CSCL 10/3

New test equipment and special demountable cells were designed and constructed for use in preliminary assessment of newly proposed accelerated life tests. Cycling tests were performed on groups of five cells each at ambient temperatures of -20, -5, 10, 25, and 40 C, and both with and without temperature gradients. The special demountable cells with internal heaters were used to provide an internal cell temperature of 40 C for those cells with temperature gradients. Author (GRA)

N73-13067# Boeing Co., Philadelphia, Pa. Vertol Div.
ADVANCED TECHNOLOGY HIGH-CAPACITY HOIST-DRIVE SYSTEM Final Technical Report
Dennis Stein, Richard F. Campbell, Newt N. Rothman, and Joseph Shefrin Apr. 1972 220 p refs
(Contract DAAJ02-70-C-0042)
(AD-746629; D210-10405-1; USAAMRDL-TR-72-21) Avail: NTIS CSCL 01/3

Studies of current airborne hoist drive systems for handling external loads indicate that use of present technology to design hoist systems with larger capacities will result in excessive weights, incompatible configurations, complex controls, and other undesirable factors. A pneumatic air-turbine motor drive shows the best potential for powering high-capacity systems. For helicopter hoisting applications, there is no practical limit for system capacity. This report documents a program of design and design analysis of an advanced technology hoist-drive subsystem applicable to a family of cargo hoists with capacities ranging from 12.5 to 50 tons. Author (GRA)

N73-13068# Tyco Labs., Inc., Waltham, Mass.
LOW TEMPERATURE ELECTROCHEMICAL SYSTEMS Annual Technical Report, 1 Jul. 1971 - 30 Jun. 1972
Paul A. Malachesky and Kathleen Cahill Aug. 1972 88 p refs
(Contract DAAB07-71-C-0291)
(AD-749270; C-153; ECOM-0291-2; ATR-1) Avail: NTIS CSCL 10/3

Zinc-air batteries are subject to a marked decrease in performance at low temperature operation. Therefore, a detailed study of the pertinent parameters influencing air cathode behavior at reduced temperatures has been initiated. A series of electrode materials of different composition and physical characteristics has been used for the study. The electrochemical investigation included temperature studies of the charge transfer process occurring in the activation-controlled region of the O(2-) in the diffusion region. Real surface area determinations were made by two different methods: H2-deposition and BET measurements. The results obtained show that the major effect of temperature reduction is a decrease in transport-controlled currents. GRA

N73-13865* Tennessee Univ., Tullahoma. Space Institute.
CONTRIBUTIONS FROM SPACE TECHNOLOGY TO CENTRAL POWER GENERATION
John B. Dicks, Jr. *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 361-368 refs (For availability see N73-13829 04-30)
(Contracts F44620-69-C-0031; DI-14-32-0001-1213)
CSCL 10B

N73-13866* Florida Univ., Gainesville. Solar Energy and Energy Conversion Lab.
SOLAR ENERGY, ITS CONVERSION AND UTILIZATION
Erich A. Farber *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 369-388 (For availability see N73-13829 04-30)
CSCL 10C

N73-13870* Little (Arthur D.), Inc., Cambridge, Mass. Engineering Sciences Section.
POWER WITHOUT POLLUTION
Peter E. Glaser *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 431-439 refs (For availability see N73-13829 04-30)
CSCL 10B

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N73-13069*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING

BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 107, OCTOBER 1972
Oct. 1972 105 p refs
(NASA-SP-7011(107)) Avail: NTIS HC $3.00 CSCL 06E

This Supplement of Aerospace Medicine and Biology lists 353 reports, articles, and other documents announced during September 1972 in Scientific and Technical Aerospace Reports or in International Aerospace Abstracts. In its subject coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Author (GRA)

N73-13070 Iowa State Univ. of Science and Technology, Ames.
REMOTE DETECTION OF MOISTURE STRESS: FIELD AND LABORATORY EXPERIMENTS Ph.D. Thesis
Richard Eugene Carlson 1971 105 p
Avail: Univ. Microfilms Order No. 72-5184

The relationship between the spectral properties of leaves and the water status of leaves from three crop species was studied under laboratory conditions. The wavelengths region examined was from 800 to 2,600 millimicrons. Leaf reflectivity and leaf absorptivity were highly correlated with relative leaf water content. The relationship between leaf transmissivity and relative leaf water content was variable with wavelength. Leaf transmissivity was, however, highly correlated with leaf specific densities. Relative leaf water content was estimated from leaf reflectivity. The estimates were improved if leaf transmissivity was included in the regression equation. In field experiments leaf temperature was significantly affected by relative leaf water content, air temperature, and vapor pressure deficit. A relative leaf water content by vapor pressure deficit interaction term was shown to affect leaf temperature. Air temperature affected leaf temperature by modifying stomatal conductivities and, hence, the leaf transpiration rate. Dissert. Abstr.

N73-13071*# Southwest Research Inst., San Antonio, Tex.
ASSISTANCE TO NASA IN BIOMEDICAL AREAS OF THE TECHNOLOGY UTILIZATION PROGRAM Final Report, 24 Aug. 1971 - 24 Aug. 1972
David F. Culclasure and Linda Eckhardt 24 Aug. 1972 163 p refs
(Contract NASw-1867)
(NASA-CR-129588) Avail: NTIS HC $10.25 CSCL 06B

The applications of aerospace technology to biomedical research are reported. The medical institutions participating in the Biomedical Applications Program are listed along with the institutions currently utilizing the services of the Southwest Research Institute Biomedical Applications Team. Significant accomplishments during this period include: ultra-low bandpass amplifier for gastro-intestinal electric potentials; non-encumbering EEG electrode assembly suitable for long term sleep research; accurate cardiac telemetry system for active subjects; warning system for the deaf; tracking cane for the blind; and an improved control mechanism to expand the self-sufficiency of quadriplegics. F.O.S.

N73-13072# Joint Publications Research Service, Arlington, Va.
SELECTIONS FROM VOYENNO-MEDITSINSKIY ZHURNAL NO. 8, 1972
17 Nov. 1972 14 p refs Transl. into ENGLISH from Voyenno-Med. Zh. (Moscow), no. 8, 1972
(JPRS-57541) Avail: NTIS HC $3.00 CSCL 06S

An evaluation of the state of man's psychic functions both during a period of prolonged (up to 30 days) presence at depths up to 160 meters, during the breathing of nitrogen-oxygen and helium-oxygen mixtures and after emergence at the surface is reported along with a review of literature on studies of the possibility of using a skin analyzer for communication purposes, and a study of the effect of mood on performance. For individual titles, see N73-13073 through N73-13075.

N73-13073 Joint Publications Research Service, Arlington, Va.
STUDY OF SOME PSYCHIC FUNCTIONS OF AQUANAUTS DURING PROLONGED EXPOSURE TO INCREASED PRESSURE
V. A. Bodrov, A. S. Yegorov, and B. N. Yakovets *In its* Selections from Voyenno-Med. Zh. no. 8, 1972 17 Nov. 1972 p 71-73 refs (For availability see N73-13072 04-04)

The state of man's mental functioning is evaluated for aquanauts during prolonged (up to 30 days) exposure to depths up to 160 m, breathing nitrogen-oxygen, or helium-oxygen mixtures, and after emergence at the surface. The dynamics of the indices for attention, memory and cogitation were investigated at depths of 5, 40, 70, 100, 130, and 160 m. The nitrogen mixtures were used at depths of 5 and 40 m, and the helium mixtures at depths of 40 m or more. It was found that the nitrogen mixture is tolerated less easily at the 40 m level, and it is concluded that there is no apparent aftereffect caused by prolonged, increased pressure. The results indicate that trained men can be subjected to pressure up to 16 atm, for prolonged periods, without mental impairment. F.O.S.

N73-13074 Joint Publications Research Service, Arlington, Va.
USE OF A SKIN ANALYSOR AS A COMMUNICATION CHANNEL IN CONTROLLING ACTIVITY (REVIEW OF THE LITERATURE)
S. D. Baryshnikov *In its* Selections from Voyenno-Med. Zh. no. 8, 1972 17 Nov. 1972 p 60-62 refs (For availability see N73-13072 04-04)

Studies on the possibilities of using a skin analyzer for communication purposes are reviewed. Among the studies reviewed are the use of tactile and vibrational sensitivity in controlling activity, and an electromechanical tactile control system which transmits information on banking and pitching. It is concluded that the tactile (vibrational) sensitivity of the skin analyzer offers great possibilities as a means of communication. F.O.S.

N73-13075 Joint Publications Research Service, Arlington, Va.
MOOD AS A FACTOR IN AN OPERATOR'S PERFORMANCE
A. S. Yegorov *In its* Selections from Voyenno-Med. Zh. no. 8, 1972 17 Nov. 1972 p 63-64 (For availability see N73-13072 04-04)

The regulating influence of mood on the effectiveness of performance is discussed in terms of the subject's behavior being directed along a previously prepared path. The effectiveness is presented for definite and indefinite instructions. It is concluded that since the dynamics of test results can be affected by changes in parameters such as regulated or unregulated instructions, it is necessary to maintain a uniform mood in the subject for the entire test period. F.O.S.

N73-13076*# Translation Consultants, Ltd., Arlington, Va.
POLYVINYLPYRROLIDONE USED AS CRYOPROTECTIVE SUBSTANCE FOR ERYTHROCYTE PRESERVATION
E. Dobry, J. Livora, V. Sebestik, and J. Jelinek Washington NASA Dec. 1972 8 p refs Transl. into ENGLISH from Vnitrni Lekar. (Brno), v. 15, no. 12, 1969 p 1152-1155
(Contract NASw-2038)
(NASA-TT-F-14590) Avail: NTIS HC $3.00 CSCL 06A

Results obtained with polyvinylpyrrolidone (PVP) used as a cryoprotective substance for erythrocyte preservation were presented. Best in vitro results were obtained by rapid freezing of whole blood with a 9% concentration of PVP. Post-transfusion survival values after 24 hours amounted to approximately 76% of transfused erythrocytes. However, for routine blood transfusion service use the method is not fully satisfactory. Author

N73-13077*# Translation Consultants, Ltd., Arlington, Va.
MICROELECTROPHORESIS OF HUMAN ERYTHROCYTES: IMPORTANCE AND USES IN OBSTECTRICS AND GYNECOLOGY
I. Sagone and Arrotta Washington NASA Dec. 1972 31 p refs Transl. into ENGLISH from Ann. Ostet. Ginecol. (Milan), v. 89, 1967 p 118-137

(Contract NASw-2038)
(NASA-TT-F-14587) Avail: NTIS HC $3.75 CSCL 06P

On the basis of already acquired ideas about the subject, the electrophoretic behavior of blood cells during the menstrual cycle, in both normal and pathological pregnancy, and in gynecological affections whether of inflammatory nature or comprising benign or malignant tumors is studied. The method used for the study is described in detail along with the clinical diagnostic implications. Author

N73-13078*# Techtran Corp., Glen Burnie, Md.
STUDY OF THE RESISTANCE OF CULTURED AND NATURAL MICROBES USING THE ETHYLENE OXIDE STERILIZATION METHOD
E. Steiger Washington NASA Nov. 1972 16 p refs Transl. into ENGLISH from Z. Ges. Hygiene Ihre Grenzgebiete (Leipzig), v. 17, no. 10, 1971 p 744-749
(Contract NASw-2037)
(NASA-TT-F-14612) Avail: NTIS HC $3.00 CSCL 06M

Resistance of cultured and natural microbes in the ethylene oxide sterilization method as a prerequisite for a test method corresponding to the special method of action of the killing of microbes is discussed. Natural microbes, dried on filter paper and covered with egg white, proved to be very resistant. The possibility of increasing resistance through manipulation of the number of microbes and the suspension medium is mentioned. It is highly advantageous to cultivate the spore strips on solid media, when the results of the test can be determined after only three days. In testing with spore strips, a much better reproducibility and a much smaller scatter were achieved than with existing spore tests. Author

N73-13079*# Scientific Translation Service, Santa Barbara, Calif.
THE SCIENTIFIC BASIS OF MINERAL WATER THERAPY, ESPECIALLY THAT OF THE KARLSBAD MUEHLBRUNN
W. Wiechowski Washington NASA Nov. 1972 10 p Transl. into ENGLISH from Prager Med. Wochenschr. (Prague), no. 24, 1914 p 299-301
(Contract NASw-2035)
(NASA-TT-F-14620) Avail: NTIS HC $3.00 CSCL 06E

The results of experiments with rabbits given different diets to determine cation changes in the body are presented. Particular attention was given to mineral water drinking diets and their therapeutic value. Author

N73-13080*# National Aeronautics and Space Administration, Washington, D.C.
IN REGARD TO BACTERIAL REDUCTION OF ORGANICALLY BOUND PHOSPHORIC ACID
H. K. Barrenscheen and H. A. Beckh-Wodmanstetter Dec. 1972 11 p refs Transl. into ENGLISH from Biochem Z. (Heidelberg), v. 149, 1923 p 279-283
(NASA-TT-F-14723) Avail: NTIS HC $3.00 CSCL 06M

Blondlot-Dusart tests on putrid blood give irreproachable proof that bacteria under anaerobic conditions at suitable temperature are capable of reducing organically bound phosphoric acid sufficiently so as to obtain a positive reaction. Experiments performed on human or canine blood obtained under sterile precautions prove completely negative and it is concluded that the optional anaerobiants examined - and belonging to the Proteus group - are by themselves not capable for the reduction of phosphoric acid. G.G.

N73-13081*# National Aeronautics and Space Administration, Washington, D.C.
DO MICROBES REDUCE PHOSPHATE?
F. Liebert Dec. 1972 13 p Transl. into ENGLISH from Zentr. Bakteriol, Parasitenk., Abt. 2 (Jena), v. 72, 1927 p 369-374
(NASA-TT-F-14724) Avail: NTIS HC $3.00 CSCL 06M

It was derived from thermo-chemical data that phosphate reduction through mannite can never provide the bacteria with a gain in energy and it was further proven that this process, when it takes place, does not proceed analog to the process of denitrification. It was also shown, that the results of Rudakov's analyses do not by themselves constitute proof of a phosphate reduction. By means of several distinct qualitative reactions reduction products of the phosphorous acid were searched for but were never encountered. Author

N73-13082*# Oak Ridge National Lab., Tenn.
BIOLOGY DIVISION HABROBRACON EXPERIMENT P-1079 Annual Report, 1 Jan. - 31 Dec. 1968
31 Dec. 1968 35 p refs
(NASA Order W-12792)
(NASA-CR-127142; ORNL-TM-3628) Avail: NTIS HC $3.75 CSCL 06R

Dosimetric analyses accumulated during the five-year period of the biosatellite program are summarized. These data are from a unique source placed in a unique optical bench, the biosatellite. Thus the multitudinous array of dosimeters was mandatory to give confidence in the experiment. Author

N73-13083# RAND Corp., Santa Monica, Calif.
INTRINSIC OSCILLATIONS IN NEURAL NETWORKS: A LINEAR MODEL FOR PARALLEL, SINGLE-UNIT PATHWAYS
R. J. MacGregor Aug. 1972 28 p refs
(R-984-RC) Avail: NTIS HC $3.50

An analytical exploration is presented of neuroelectric oscillation in configurations consisting of two parallel, single-unit pathways feeding back on a single primary cell. A linear model with time-lag is used to derive theoretical maps of the characteristic states of such systems. It was found that increasing the mean interconnection coefficient increases the endurance of the leading characteristic state, and increasing the average interunit conduction time increases the number of states that endure for relatively long times as compared to representative times of the system. A differential in conduction time between two parallel pathways essentially tends (1) to increase the number of characteristic states in a given frequency range; (2) to increase slightly the endurance of a given characteristic state; and (3) to relax somewhat the conditions for stability (except for the case of two parallel excitatory pathways). Author

N73-13084*# Naval Aerospace Medical Research Lab., Pensacola, Fla.
SPECIFIC ACUTE LOSSES OF VESTIBULAR FUNCTION IN MAN FOLLOWING UNILATERAL SECTION OF ONE OR ALL COMPONENTS OF THE EIGHTH CRANIAL NERVE
Earl F. Miller, II, Jack L. Pulec, James G. Wilcox, and Ashton Graybiel 21 Jan. 1972 20 p refs
(NASA Order T-81633; NASA Order L-43518)
(NASA-CR-129672; AD-747627; NAMRL-1156) Avail: NTIS HC $3.00 CSCL 06P

Vestibular and related responses of four patients before and after partial or complete unilateral sectioning of the VIIIth nerve in the treatment of severe vertigo are compared. Measured responses were evaluated with regard to diagnosing a unilateral disorder. Author

N73-13085# Joint Publications Research Service, Arlington, Va.
METHODS AND TECHNIQUE OF MACHINE ANALYSIS OF BIOLOGICAL STRUCTURES
G. M. Frank and G. R. Ivanitskiy 3 Nov. 1972 28 p refs Transl. into ENGLISH from the book "Metody i Tekh. Mashinnogo Analiza Biol. Struktur" Moscow, 1972 28 p
(JPRS-57418) Avail: NTIS HC $3.50

The application of electronic computers for automatic analyses of structures observed by means of optical or electron microscopes is studied. Investigations of single layer and multiple layer biological preparations are reported and the automatic analysis of a planar contour for chromosomes is illustrated. Author

N73-13086*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY QUARANTINE Semiannual Review, 1 Jan - 30 Jun. 1971
30 Jun. 1971 138 p refs
(Contract NAS7-100)
(NASA-CR-129793; JPL-900-556) Avail: NTIS HC $9.00 CSCL 06M

Developed methodologies and procedures for the reduction of microbial burden on an assembled spacecraft at the time of encapsulation or terminal sterilization are reported. This technology is required for reducing excessive microbial burden on spacecraft components for the purposes of either decreasing planetary contamination probabilities for an orbiter or minimizing the duration of a sterilization process for a lander. Author

N73-13087*# BioTechnology, Inc., Falls Church, Va.
MEASUREMENT OF OPERATOR WORKLOAD IN AN INFORMATION PROCESSING TASK
Larry L. Jenney, Harry J. Older, and Bernard J. Cameron Washington NASA Dec. 1972 71 p refs
(Contract NAS1-10118)
(NASA-CR-2150) Avail: NTIS HC $3.00 CSCL 05E

This was an experimental study to develop an improved methodology for measuring workload in an information processing task and to assess the effects of shift length and communication density (rate of information flow) on the ability to process and classify verbal messages. Each of twelve subjects was exposed to combinations of three shift lengths and two communication densities in a counterbalanced, repeated measurements experimental design. Results indicated no systematic variation in task performance measures or in other dependent measures as a function of shift length or communication density. This is attributed to the absence of a secondary loading task, an insufficiently taxing work schedule, and the lack of psychological stress. Subjective magnitude estimates of workload showed fatigue (and to a lesser degree, tension) to be a power function of shift length. Estimates of task difficulty and fatigue were initially lower but increased more sharply over time under low density than under high density conditions. An interpretation of findings and recommendations for future research are included. This research has major implications to human workload problems in information processing of air traffic control verbal data. Author

N73-13088*# Techtran Corp., Glen Burnie, Md.
IS PHYSICAL AND MENTAL EXHAUSTION CAUSED BY A SHORTAGE OF ATMOSPHERIC IONS?
Walter Stark Washington NASA Dec. 1972 6 p Transl. into ENGLISH from Med. Tribune, no. 44, Nov. 1972
(Contract NASw-2485)
(NASA-TT-F-14646) Avail: NTIS HC $3.00 CSCL 06P

Various opinions are weighed and discussed concerning exhaustion caused by atmospheric ion shortage. One view is that shortage of atmospheric ions leads to rapid physical and mental fatigue, states of exhaustion and anxiety, difficulty in sleeping as well as other psychoneurotic and psychosomatic symptoms. A second view states that increased amounts of negative atmospheric ions are supposed to improve physical and mental conditions. Author

N73-13089*# Techtran Corp., Glen Burnie, Md.
STUDIES ON PRE-BIOLOGICAL EVOLUTION. 3: BLACK AZULMIC ACIDS OBTAINED FROM AMMONIUM CYANIDE
M. Labadie, R. Jensen, and E. Neuzil Dec. 1972 12 p refs Transl. into ENGLISH from Biochim. Biophys. Acta (Amsterdam), v. 165, 1968 p 525-533
(Contract NASw-2037)
(NASA-TT-F-14640) Avail: NTIS HC $3.00 CSCL 06A

The interest in azulmic acids is connected with the problem of pre-biological molecular evolution; the hydrolysis of azulmic acids gives rise to several natural amino acids, urea, guanidine, glycocyamine, and 5-amino 4-imidazole carboxamidine. Author

N73-13090# Florida Univ., Gainesville. Dept. of Physics and Astronomy.
CHARGED PARTICLE IMPACT PHENOMENA FOR RADIOBIOLOGICAL APPLICATIONS Progress Report
Alex E. S. Greene 15 Jun. 1972 51 p refs Sponsored by AEC
(ORO-3798-52) Avail: NTIS

Progress is reported in the microscopic approach to investigation of the underlying physical mechanisms in radiobiology. In this approach systematic studies of basic atomic molecular cross-sections and energy assignments are applied to energy deposition calculations of interest in radiobiology. Emphasis was placed on the spatial aspects and the biological aspects of the energy deposition problem. NSA

N73-13091# Cornell Univ., Ithaca, N.Y.
STUDIES OF PHOTOSYNTHETIC ENERGY CONVERSION Comprehensive Three-Year Report, 1 Sep. 1969 - 31 Aug. 1972
Roderick K. Clayton 31 Aug. 1972 51 p refs
(Contract AT(11-1)-3162)
(COO-3162-9) Avail: NTIS
The composition, structure, and photochemical mechanisms of photosynthetic membranes and tissues and reaction centers were studied in various strains of bacteria. Data cover electron transfer, absorption band shifts in pigments of rcp, and fluorescence. The effect of antibodies and viruses in such systems was also analyzed. E.H.W.

N73-13092# Colorado Univ., Denver. Medical Center.
PULMONARY GAS TRANSPORT AND THE REGULATION OF VENTILATION AT REST AND EXERCISE Annual Progress Report, 1 Jan. - 31 Dec. 1971
Giles F. Filley Jun. 1972 41 p refs
(Contract DA-49-193-MD-2227)
(AD-746979; PR-4) Avail: NTIS CSCL 06/5

Patients with pulmonary disease and normal men have been studied experimentally to determine, respectively, the pulmonary abnormalities causing arterial hypoxemia and the mechanisms responsible for the hypoxic drive of man during exercise. Forty-seven cases of fibrotic lung disease were analyzed with the aid of a two-compartment lung model which dealt with O2 and CO2 exchange deficiencies due to wasted ventilation and shunted blood flow. Carbon monoxide data analysis is not yet finished. Hypoxic and hypercapneic drives were measured in 8 subjects at rest and at 3 levels of supine bicycle exercise. Both the respiratory mass spectrometer and the fuel cell O2 analyzer underwent substantial improvements during the year.
Author (GRA)

N73-13093# Naval Medical Field Research Lab., Camp Lejeune, N.C.
MAXIMAL OXYGEN INTAKE AS A PREDICTOR OF PERFORMANCE IN RUNNING EVENTS Final Medical Research Progress Report
Philip J. Rasch Jul. 1972 17 p refs
(AD-746867; PR-22) Avail: NTIS CSCL 06/16

The maximal oxygen intake of Marine Corps enlisted men was assessed by means of a treadmill test and predicted by means of a step test and a bicycle ergometer ride. The subjects then ran 1000 meters, 1.5 miles, and 3 miles. Correlations between the assessed maximal oxygen intakes and the predicted intakes were made. Author (GRA)

N73-13094# Columbia Univ., New York. Psychophysics Lab.
RANGE AND TIME ESTIMATES OF DYNAMIC VISUAL TARGET
Eugene Galanter 1 Aug. 1972 22 p refs
(Contract N00014-67-A-0108-0031)
(AD-747271; PLR-27) Avail: NTIS CSCL 05/10

The report presents data based on field research. Previous data involving the ranging of aircraft by ground observers and of ground targets by aerial observers were extended to the ranging of boats and marine markers by ground observers and aerial observers. Time estimates to impact by aerial observers are also reported. Author (GRA)

N73-13095# Naval Air Development Center, Warminster, Pa. Crew Systems Dept.
FLASHBLINDNESS RECOVERY FOLLOWING EXPOSURE TO CONSTANT ENERGY ADAPTIVE FLASHES Interim Report
G. T. Chisum 30 Dec. 1971 29 p refs
(AD-747631; NADC-CS-7135) Avail: NTIS CSCL 06/19

Times required to detect a simple display were measured following exposures to adapting flashes of different durations but equal integrated luminances. The results indicate no consistent variation in response times as a function of flash duration when the total integrated luminance of the flash is constant. The variations which do occur are interpreted as indicating that a strict reciprocity relationship does not apply at very short adapting flash durations. Author (GRA)

N73-13096# Technology, Inc., San Antonio, Tex. Life Sciences Div.
OCULAR EFFECTS OF REPETITIVE LASER PULSES Final Report, Apr. 1971 - Jun. 1972
C. H. Skeen, W. Robert Bruce, J. H. Tips, Jr., M. Gearity Smith, and G. G. Garza 30 Jun. 1972 93 p refs
(Contract F41609-71-C-0018)

(AD-746795) Avail: NTIS CSCL 06/18
An argon-ion laser was used to investigate the ocular effects of repetitive laser pulses on rhesus monkeys. The primate eyes were irradiated by trains of pulses held constant at 10 milliseconds, and the duration of the trains was kept uniform at 0.5 sec. The pulse repetition rate was used as a parameter and this parameter was varied to take on the values of 2 Hz(single pulse), 10 Hz, 100Hz, 1 kHz and 10 kHz. Retinal burn thresholds were determined based on the 1 hr criterion for the appearance of ophthalmoscopically visible lesions. Author (GRA)

N73-13097# Technology, Inc., San Antonio, Tex. Life Sciences Div.
OCULAR EFFECTS OF NEAR INFRARED LASER RADIATION FOR SAFETY CRITERIA Final Report, Mar. 1971 - Jun. 1972
C. H. Skeen, W. Robert Bruce, J. H. Tips, Jr., M. Gearity Smith, and G. G. Garza Jun. 1972 86 p refs
(Contract F41609-71-C-0016; AF Proj. 6301)
(AD-746793) Avail: NTIS CSCL 06/18
Ocular effects of near infrared laser radiation were studied using a Nd3+ - YAG laser which emitted light at a wavelength of 1060 nm in the TEM00 mode. Retinal burn data were obtained on rhesus monkey eyes with the exposure duration used as a parameter. The exposures were for 1 sec, .1 sec, .01 sec, .001 sec and .0000001 sec durations and for trains of the .0000001 sec pulses with a pulse repetition rate of 1kHz lasting for 0.5 sec. Thirty eyes were irradiated for each exposure duration. The data were analyzed to find the energy per pulse corresponding to the retinal burn probability P = 0.5 using (1) a probit analysis and (2) a straightforward arithmetical averaging of the retinal burn thresholds obtained for each eye. Author (GRA)

N73-13098# American Inst. for Research, Silver Spring, Md. Inst. for Research in Psychobiology.
PSYCHOBIOLOGICAL FACTORS ASSOCIATED WITH MONOTONY TOLERANCE Final Report, 1 Jun. 1971 - 31 May 1972
Thomas I. Myers Jul. 1972 76 p refs
(Contract N00014-71-C-0385; NR Proj. 197-015)
(AD-747272; AIR-R72-1; AIR-26400-7/72-FR) Avail: NTIS CSCL 05/10
The research goal was to identify the characteristics of an individual predictive of his tolerance for extreme monotony, as an eventual aid in the selection of persons for duty in isolated and monotonous settings. Author (GRA)

N73-13099# Cincinnati Univ., Ohio.
INVESTIGATION OF OCULAR HAZARD FROM LASERS IN HUMAN SUBJECTS Final Report, Aug. 1969 - Dec. 1971
Kenneth Rowe and R. James Rockwell, Jr. May 1972 44 p refs
(Contract F41609-69-C-0052; AF Proj. 6301)
(AD-747058) Avail: NTIS CSCL 06/16
Results are presented of experimental studies to determine the threshold level for minimal retinal lesions produced in the human eye by argon laser radiation. A description is given of the equipment used and the method of data recording. Data from patients suffering from diabetic retinopathy was compared with data from non-diabetic patients. The lesion formation threshold level on one volunteer with a perfectly normal eye was noted. One year following the exposures pigment formation was observed. Author (GRA)

N73-13100# George Washington Univ., Washington, D.C.
DYSBARIC OSTEONECROSIS: AN ANNOTATED BIBLIOGRAPHY WITH PRELIMINARY ANALYSES
Margaret F. Werts and Charles W. Shilling 31 Jul. 1972 76 p refs
(Contract N00014-67-A-0214-0009)
(AD-747258; GW-BSCP-72-10P) Avail: NTIS CSCL 06/5
The citations and abstracts are arranged alphabetically by the author's last name. A preliminary analysis of the material is presented in order to provoke discussion and as a suggestion for future in-depth analyses. This material is presented as the second part of the report. GRA

N73-13101# Louisiana State Univ., Baton Rouge. Coll. of Engineering.
A DETERMINISTIC MODEL OF A HUMAN PERFORMING COMPENSATORY TRACKING
J. A. Planchard, J. Barzniji, and T. Perkins 3 Aug. 1972 58 p refs
(Contract F44620-68-C-0021; AF Proj. 9769; Proj. Themis)
(AD-746725; LSU-T-TR-49; AFOSR-72-1349TR) Avail: NTIS CSCL 05/10
A non-linear, continuous model of well-trained human operator performing a compensatory tracking task was developed. This model, which consists of a tracking of an acquisition mode, satisfactorily tracks a low level fly-by simulation of a high performance aircraft. The model successfully simulates the measured performance of actual operators for a variety of flight paths. A real time simulation of the tracking system, with actual operators in the tracking loop, was programmed on the LSU hybrid computer. These data were used to authenticate parameters used in the above model. Author (GRA)

N73-13102# Army Foreign Science and Technology Center, Charlottesville, Va.
A COMPARATIVE EVALUATION OF THE ENERGY OF LETHAL DOSES OF GAMMA RADIATION, VISIBLE LIGHT AND THE ENERGY OF CELLULAR BASAL METABOLISM
M. I. Ozerskii 17 Apr. 1972 8 p refs Transl. into ENGLISH from Sb. Tr. po Agron. Fiz., Vses. Akad. Sel'skokhoz. Nauk (Khoz), no. 17, 1969 p 51-53
(AD-746750; FSTC-HT-23-322-72) Avail: NTIS CSCL 06/18
A comparison is made of the energy of lethal doses of gamma radiation and visible light. It is determined that the energy of the lethal dose of gamma radiation is many orders of magnitude lower than the energy of a lethal dose of visible light and the energy of the basal metabolism of a cell. Author (GRA)

N73-13103# Texas Technological Univ., Lubbock. Center of Biotechnology and Human Performance.
THE EFFECTS OF REINFORCEMENT AND RESPONDING TO BOTH SIGNAL AND NON-SIGNAL EVENTS ON VIGILANCE PERFORMANCE
Daisuke B. Nakashima and Charles G. Halcomb 1972 17 p refs
(Contract DAAD05-69-C-0102; DA Proj. 1T0-14501-B-81-A; Proj. Themis)
(AD-747798) Avail: NTIS CSCL 05/10
In the standard vigilance task, subjects are provided with a single response button and instructed to respond to the presentation of a signal stimulus. This response has been used as the primary measure of the more continuous responding to the visual display. Some question has arisen, however, as to the appropriateness of this response. Author (GRA)

N73-13104# Texas A&M Univ., College Station. Dept. of Industrial Engineering.
EFFECTS OF PROLONGED STRESS ON STEROID LEVELS IN PAROTID FLUID M.S. Thesis
Russell C. Hutcherson Dec. 1971 44 p refs Sponsored in part by Army
(AD-747682) Avail: NTIS CSCL 05/10
Ten subjects of approximately the same age, size, and education group were exposed to an unchanging mental stress for a two hour period. Using sour candies to stimulate parotid gland activity, parotid fluid samples were collected at thirty minute intervals. Statistical analysis of the steroid levels showed that there was no significant change in cortisol levels in parotid fluid over the two hour sampling period. Author (GRA)

N73-13105# Texas Technological Univ., Lubbock. Center of Biotechnology and Human Performance.
THE EFFECTS OF NOISE AND RESPONSE COMPLEXITY UPON VIGILANCE PERFORMANCE
Jerry M. Childs and Charles G. Halcomb 1972 24 p refs Presented at the Southwestern Psychol. Assoc. Conv., Oklahoma City, Apr. 1972
(Contract DAAD05-69-C-0102; DA Proj. 1T0-14501-B-81-A; Proj. Themis)
(AD-747797) Avail: NTIS CSCL 05/10

Visual vigilance (detection) performance of 140 Ss was investigated with respect to environmental stimulation (noise) and intraorganismic stimulation (simple vs. complex response). Correct detections and false alarms were analyzed. Results are evaluated in terms of the activation hypothesis. Author (GRA)

N73-13106# Naval Aerospace Medical Research Lab., Pensacola, Fla.

HUMAN HEAD AND NECK RESPONSE TO IMPACT ACCELERATION

Channing L. Ewing and Daniel J. Thomas Aug. 1972 386 p Prepared jointly with Army Aeromedical Research Lab.
(AD-747988; NAMRL-MONO-21; USAARL-73-1) Avail: NTIS CSCL 06/19

A methodical investigation and measurement of human dynamic response to impact acceleration was conducted. Linear accelerations were measured on the top of the head, at the mouth, and at the base of the neck. Angular velocity was also measured at the base of the neck and at the mouth. A redundant photographic system was used for validation. All data were collected in computer-compatible format and data processing was by digital computer. Selected data analysis on 41 representative human runs involving 12 subjects of the 236 human runs completed to date are presented. Description of the experimental design, data collection and processing is given in detail. Ancillary research efforts in support of the program are also described. Representative plots of the human kinematic response are presented, discussed, and compared. Repeatability and quality control plots are also presented. There are a total of 755 computer drawn plots illustrating a characteristic, repeatable response of human subjects to impact acceleration. Author (GRA)

N73-13107# California Univ., Los Angeles. School of Engineering and Applied Science.

UNDERWATER WORK PERFORMANCE AND WORK TOLERANCE

Glen H. Egstrom, Gershon Weltman, Allan D. Baddeley, William J. Cuccaro, and Michael A. Willis Jul. 1972 64 p refs
(Contract N00014-69-A-0200-4034; NR Proj. 196-100)
(AD-747701; UCLA-ENG-7243; TR-51) Avail: NTIS CSCL 06/19

The report presents findings of the research efforts for 1971 in the study of underwater work performance and work tolerance conducted at the University of California, Los Angeles. The studies were directed towards the development of performance decrement curves related to the specific variables which affect underwater work. Experiments designed to add to the body of knowledge necessary to the formation of decrement curves were conducted. The experiments examined: (a) the effect of cold-water exposure upon memory, reasoning ability, and vigilance, (b) the effect of depth upon memory, (c) wet vs. dry training for a specific underwater task, and (d) the physiological and performance effects of heliox as a breathing gas in cold water. Author (GRA)

N73-13108# Connecticut Coll., New London. Dept. of Psychology.

DEVELOPMENT OF TECHNIQUES FOR MEASURING PERFORMANCE IN THE UNDERSEA ENVIRONMENT Final Report, 1 Mar. 1970 - 31 Oct. 1971

John R. Mackinnon 15 Apr. 1972 10 p refs
(Contract N00014-70-C-0244)
(AD-748036) Avail: NTIS CSCL 05/10

The overall objective of the project was to develop precise, reliable techniques for monitoring changes in human performance during exposure to unusual environmental conditions. Specifically, this research was designed to provide base-line information on the usefulness of a selected task as an instrument in assessing performance degradation under adverse conditions germane to the diving situation. The task selected for investigation was a modified version of the Stroop Color-Word Interference Test (CWIT). Experiments conducted were designed to determine the efficiency of this test in evaluating the effects of environmental and psychological stress on cognitive functioning. GRA

N73-13109# Air Force Weapons Lab., Kirtland AFB, N.Mex.

WATERFOWL MIGRATION CORRIDORS Technical Report, 1 Jul. - 23 Aug. 1972

Robert C. Beason Aug. 1972 12 p refs
(AF Proj. 68M3E02)
(AD-748114; AFWL-TR-72-166) Avail: NTIS CSCL 06/3

Migration corridors and their densities for ducks and geese, wintering population densities, and some information on the influence of weather on migration are presented. The relationship of bird migrations to aviation safety is discussed.
Author (GRA)

N73-13110# Texas Technological Univ., Lubbock. Center of Biotechnology and Human Performance.

VIGILANCE PERFORMANCE AS A FUNCTION OF TYPE AND LATENCY OF RESPONSE TO THE SIGNAL EVENT

Daisuke B. Nakashima and Charles F. Halcomb 1972 8 p
(Contract DAAD05-69-C-0102; DA Proj. 1T0-14501-B-81-A; Proj. Themis)
(AD-747801) Avail: NTIS CSCL 05/10

Investigations of vigilance performance have typically required subjects to make overt responses to the signal events only. When an overt response is not made to the stimulus, it is assumed that the subject observed the stimulus and decided that it was not a signal. A different approach to the study of vigilance has been to require responses to both signal and non-signal events. The investigations indicate that in general, the additional response requirement does not change the characteristic performance demonstrated in vigilance tasks. False alarms made by subjects responding to both signal and non-signal events are discussed.
Author (GRA)

N73-13111# Texas A&M Univ., College Station. Dept. of Industrial Engineering.

EVALUATING THE USE OF PAROTID FLUID ANALYSIS AS A MEASURE OF TASK DIFFICULTY M.S. Thesis

Larry W. Williams 1971 63 p refs Sponsored by Army
(AD-747671) Avail: NTIS CSCL 05/10

The purpose of the paper was to determine the usefulness of the parotid fluid analysis technique in measuring mental stress. Ten subjects were used in the experimental portion of this work. Three levels of stress were set up. A low stress level was taken with the subjects at rest. The medium and high stress levels were set up using 30 and 60 revolutions per minute respectively on a rotary pursuit tracking task. Parotid fluid was collected for a 30 minute period at each of the three stress levels for each subject. The chemical analysis of the parotid fluid was carried out to determine the concentrations of corticosteroids (17-OHCS) in the parotid fluid samples. Mathematical analysis of the data indicated that there was no change in the 17-OHCS level as a result of increased stress levels. The results were attributed to using a tracking task lacking sufficient difficulty to produce mental stress. Author (GRA)

N73-13112# Texas Univ., Austin. Electronics Research Center.

THE DESIGN AND EVALUATION OF AN ARTIFICIAL EAR

Harry L. Record and E. L. Hixson 20 Apr. 1972 77 p refs Prepared in cooperation with Tracor, Inc., Austin, Tex.
(Contract F44620-71-C-0091)
(AD-746691; AFOSR-72-1117TR; TM-32) Avail: NTIS CSCL 06/5

A wideband artificial ear for the calibration of supraaural audiometric earphones was designed and constructed. The device consisted of three acoustically coupled cavities, and was designed to possess the acoustic impedance of an average human ear as seen by a standard supraaural earphone. An acoustic impedance measuring device was developed to aid in the evaluation of this artificial ear. Plots of experimentally determined acoustic impedance of this and other artificial ears are presented and discussed. Comparison of the experimentally determined acoustic impedance of the subject artificial ear with design values showed general agreement. It was concluded that lumped parameter representation of acoustic impedances, and the ability to measure acoustic impedance accurately and rapidly, are valuable tools for the development of complex acoustic systems.
Author (GRA)

N73-13113# Stanford Research Inst., Menlo Park, Calif.

MAMMAL UNDERWATER ACOUSTICS Final Report, 1 Jan. - 31 Dec. 1971

Ronald J. Schusterman 18 Jul. 1972 28 p refs
(Contract N00014-72-C-0173; SRI Proj. LSU-1071)

(AD-746520) Avail: NTIS CSCL 06/3
Underwater signal-detection performance of sea lions was influenced by changes in the probability of signal presentation in both acoustic and visual tasks. Normally, marine mammals in a signal-detection task maintain a low level of false alarms while attempting to maximize their correct detections or hits. It was shown that such an objective in a marine mammal (the California sea lion) can be changed without, in some instances, changing the animal's sensitivity. Thus, by changing its response criterion as a function of varying the probability of signal presentation, a set of probability limits could be induced into a sea lion regarding the acceptance or rejection of signal presence or signal difference. By relating the probability of hits to false alarms for several signals of varying magnitude, one can plot the receiver-operating-characteristic (ROC) curves for sea lions. Author (GRA)

N73-13848* Research Triangle Inst., Durham, N.C. Biomedical Application Team.
ADVANCEMENTS IN MEDICINE FROM AEROSPACE RESEARCH
F. Thomas Wooten *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 215-220 (For availability see N73-13829 04-30)
(Contract NASw-2273)
CSCL 06E

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N73-13114* General Electric Co., Philadelphia, Pa.
REACTION TESTER Patent
Harry H. Brown, inventor (to NASA) Issued 17 Oct. 1972 5 p Filed 7 Oct. 1970 Supersedes N72-15097 (10 - 06, p 0727) Sponsored by NASA
(NASA-Case-MSC-13604-1; US-Patent-3,698,385; US-Patent-Appl-SN-78717; US-Patent-Class-128-2N; US-Patent-Class-35-22R; US Patent-Class-273-1E) Avail: US Patent Office CSCL 05E

A reaction tester is disclosed for testing the simple and disjunctive reaction of a subject to light stimuli. The tester is in the form of a bar which has spaced grooves for receiving the index fingers of a subject. Near the bottom of each groove are openings aligned along a transverse axis to a groove and a light beam is projected through the openings to a photo transistor. The subject's finger breaks the light beam and when the finger is moved relative to the groove, the light beam actuates the transistor. A logic circuit is provided to interconnect the reaction key to a panel having neon light indicators. A ready, left and right neon light indicators are selectively actuatable. The ready light informs the subject that the test will begin. Next, either the left or right or both lights are actuated through the logic circuit. A counter is started and when the subject reacts by moving the correct finger, the light indicator is extinguished and the counter is stopped. An incorrect reaction causes an error indicator to operate. Official Gazette of the U.S. Patent Office

N73-13115*# Techtran Corp., Glen Burnie, Md.
PNEUMATIC PROSTHESIS CONTROL
C. E. Beckmann Washington NASA Nov. 1972 6 p Transl. into ENGLISH from Tech. Rundsch. (Bern), no. 22, 26 May 1972 p 41
(Contract NASw-2037)
(NASA-TT-F-14628) Avail: NTIS HC $3.00 CSCL 06B

The pneumatic control of a prosthetic arm and its application to industrial handling problems are discussed. E.H.W.

N73-13116*# Scientific Translation Service, Santa Barbara, Calif.
TIME ZONES AND SPORT
Guilherme S. Gomes Washington NASA Dec. 1972 6 p Transl. into ENGLISH from Rev. Brasil. Pesqui. Med. Biol. (Rio de Janeiro), v. 26, no. 12, 1969 p 708-710
(Contract NASw-2035)
(NASA-TT-F-14632) Avail: NTIS HC $3.00 CSCL 05E
The effect of abrupt changes in environment on the athlete's organs, systems, and performance are discussed. Only differences in the behavior of the athletes caused by differences in time zones, and not those associated with altitude and/or climate, are considered. It was suggested that air trips be taken in stages of less than four time zones and that the athlete be guaranteed a period of two days per time zone crossed, so changes are gradual before he has to exert himself to full capacity. It was also suggested that one not mistake acclimatization for adaptation, since the former is the effect of becoming used to a different climate, i.e., a biological process by which the athlete becomes used to a new environment, while the latter (adaptation) is the preparation of the athlete to accommodate his organism to the new medium. Author

N73-13117# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
PILOT PERFORMANCE AS A FUNCTION OF THREE TYPES OF ALTITUDE DISPLAYS Final Report, 4 Jan. - 1 Apr. 1972
Robert C. Pangburn, Thomas R. Metzler, and Jane M. Kline Aug. 1972 78 p refs Sponsored by FAA
(Contract F33615-71-C-1921)
(ASD-TR-72-63; FAA-RD-72-130) Avail: NTIS HC $6.00

A series of missions was flown to compare pilot performance on three altimeters: (1) AAU-19, (2) 3-inch tape, and (3) digital readout. Using a C-135B simulator, each subject flew a series of missions simulating actual procedures used in take-off, flight, and landing maneuvers. The subjects were task-loaded to prevent over concentration on altitude performance. Performance data were based on the pilot's ability to maintain altitudes specified by the ground control operator during various mission phases. From evaluation of the performance data, it was concluded that within the experimental test envelope with optimal flying conditions and high task loading the digital readout was superior to the other two instruments tested; however, the AAU-19 and 3-inch tape were within acceptable limits. Author

N73-13118# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Flugfuehrung.
ASSESSMENT OF COCKPIT DISPLAYS
Ralf Beyer 1972 30 p refs In GERMAN; ENGLISH summary Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972 (DGLR-Paper-72-97) Avail: NTIS HC $3.50

Different methods are presented for the assessment and evaluation of electronic cockpit displays. Particular emphasis is placed on control technology, experimental psychology, and subjective rating. The survey is supported by results from various experiments. Author (ESRO)

N73-13119# California State Univ., Long Beach. Dept. of Biology.
AN 8-CHANNEL, ULTRASONIC, MARINE BIO-TELEMETRY TRANSMITTER UTLIZING C/MOS (COMPLEMENTARY METAL-OXIDE SEMICONDUCTOR) DIGITAL INTEGRATED CIRCUITS
Donald W. Ferrel and Donald R. Nelson Sep. 1972 12 p refs
(Contract N00014-68-C-0318; NR Proj. 104-062)
(AD-748605; TR-6) Avail: NTIS CSCL 06/2

Up to 8 multiplexed channels of shark behavioral data at sea are obtained with a 40 kHz acoustic transmitter with a range exceeding 5 km and a life of up to 1 week. Conservation of battery power is achieved with complementary metal-oxide semiconductor (C/MOS) integrated circuits and pulse-interval data format of 10 ms pulses at intervals between 200 ms and 2 sec. A multivibrator oscillator is used to control the operating frequency which is essentially independent of temperature and pressure, and decreases slightly with battery voltage (less than 800 Hz/2-volt drop). An optional crystal oscillator maintains constant frequency. The pulse repetition rate is not significantly affected by voltage, pressure, and temperature. Fail safe devices ensure operation in the event of sensor or multiplexer failure. Author (GRA)

N73-13120# Missouri Univ., Columbia. Space Sciences Research Center.
CHRONIC OXYGEN ELECTRODES: A FEASIBILITY STUDY Final Report
Allen W. Hahn, Ronald E. Barr, and Kenneth G. Mayhan 15 Jul. 1972 50 p
(Contract DADA17-71-C-1104)
(AD-748422) Avail: NTIS CSCL 06/2

The feasibility of obtaining stable oxygen electrodes by coating with a plasma catalyzed polymer film was studied. These electrodes are to be used for chronic in vivo measurement of tissue oxygen tension. The application of the film was tested on both disc-shaped and needle-type platinum oxygen reducing polarographic electrodes in simulated biological media. It was shown that a uniform polymer film of 1-2 micrometers could be applied to the sensing surface. This could be done, however, only if the surface was cleaned by hydrofluoric acid etching. Results of testing coated electrodes showed a significant reduction in noise output and increased electrode stability. From the preliminary feasibility study, it was concluded that plasma deposited polymer films as an electrode coating is a practical technique. Author (GRA)

N73-13121# Illinois Univ., Savoy. Aviation Research Lab.
RESEARCH AND THE FUTURE OF ENGINEERING PSYCHOLOGY
Jack A. Adams Sep. 1971 21 p refs Presented at Soc. of Eng. Psychologists, Div. 21 of the Am. Psychological Assoc., 4 Sep. 1971
(Contract F44620-70-C-0105; AF Proj. 9778)
(AD-748237; ARL-71-19/AFOSR-71-6; AFOSR-72-1662TR) Avail: NTIS CSCL 05/5

The vigor of engineering psychology as an applied discipline in engineering and psychology is dependent upon the robustness of the scientific knowledge that it applies to the design of man-machine systems. As a field, engineering psychology mostly has its practitioners applying knowledge and comparatively few generating new knowledge, with the result that the capability for system innovation is not as strong as it should be. Project Hindsight of the Department of Defense and Project TRACES of the National Science Foundation show that rather long-term basic and applied research is necessary for generating the knowledge that brings impressive innovations in products. The demands of product development have called for too much short-term research and too little long-term research of the kind most effective for producing important innovations in new systems. Several remedial courses of action are considered. Author (GRA)

N73-13122# Defense Documentation Center, Alexandria, Va.
PERFORMANCE FACTORS IN UNDERWATER ENVIRONMENT Report Bibliography, Mar. 1942 - Sep. 1971
Aug. 1972 192 p refs
(AD-748000; DDC-TAS-72-42) Avail: NTIS CSCL 06/19

The 156 references in this bibliography include information on the effects of underwater environment on divers, on tools and equipment, and on human factors aspects of underwater performance. Corporate Author-Monitoring Agency and Subject Indexes are included. Author (GRA)

N73-13123# Naval Personnel and Training Research Lab., San Diego, Calif.
TECHNICIAN REQUIREMENTS FOR MAINTENANCE OF MICROELECTRONICS EQUIPMENT IN THE FLEET
J. H. Steinemann and J. D. Coady Jul. 1972 26 p refs
(AD-748040; SRR-73-2) Avail: NTIS CSCL 05/9

The increasing development and utilization of microelectronic technology in Navy shipboard equipments imposes changing demands upon the technical personnel force needed to meet fleet electronics maintenance responsibilities. The investigation assessed the present and near-future maintenance task requirements of microelectronics equipments and evaluated the extent to which shipboard technicians are qualified to meet assigned maintenance responsibilities. Evaluative information and data were obtained through a series of visits to area electronics facilities and by a questionnaire survey of Pacific Fleet technicians responsible for microelectronics equipment maintenance.
Author (GRA)

N73-13124# School of Aerospace Medicine, Brooks AFB, Tex.
THE RECORDING OF CARDIAC RHYTHMS ON A MAGNETIC TAPE FOR LATER COMPUTER INPUT ANALYSIS
Yu. V. Terekhov and I. I. Funtova 1972 7 p ref Transl. into ENGLISH from Matematischeskie Metodyanaliza Serdechnogoritna, Moscow (USSR), 1968
(AD-748105; SAM-TT-R-1144-0972) Avail: NTIS CSCL 06/12

The report describes the development of a system of recording ecgs on magnetic tape, using tape recorders of the type comet, yauza 5, and yauza 10, with the help of an ink-recording electrocardiograph of the 047 type. Presented is a description of the system, usable for dual-channel recording on the yauza-10 recorder. To record ecgs on tape recorders, one uses the frequency-modulation method on the electro-physical signal. In playback, or on entry into computer from magnetic tape, demodulators were used. GRA

N73-13125# Navy Clothing and Textile Research Unit, Natick, Mass.
ENVIRONMENTAL CONTROL UNIT FOR DAMAGE CONTROL SUIT SYSTEM
George M. Orner and Norman F. Audet Jul. 1972 35 p refs
(AD-749025; TR-101; Rept-2-71) Avail: NTIS CSCL 13/1

The Navy Clothing and Textile Research Unit (NCTRU) has developed an Environmental Control Unit (ECU) for a life support system which was designed primarily for shipboard operations, such as damage control, rescue, and engineroom use, particularly during shutdown periods. The purpose of the ECU is to control the environment within a fully enclosed, impermeable Damage Control Suit (DCS). This ECU uses wet ice in finned canisters for cooling purposes. Closed circuit, forced ventilation is effected with a battery powered fan. An easily replaceable chemical pack containing lithium hydroxide and potassium superoxide provides for carbon dioxide removal and replenishment of oxygen. A highly efficient oxygen-sensing warning device constantly monitors oxygen level within the suit.
Author (GRA)

N73-13126# Illinois Univ., Savoy. Aviation Research Lab.
SIMULATOR MOTION AS A FACTOR IN FLIGHT-DIRECTOR DISPLAY EVALUATION
Robert S. Jacobs, Robert C. Williges, and Stanley N. Roscoe Feb. 1972 31 p refs
(Contracts N00014-67-A-0305-0014; F44620-70-C-0105; NR Proj. 196-092)
(AD-749370; ARL-72-1/ONR-72-1/AFOSR-72-1) Avail: NTIS CSCL 05/9

The results of research conducted in ground-based flight simulators must be interpreted with care in view of the potential effects of differences between the simulated and actual flight environments. A study comparing various flight-director displays in a moving-base simulator was replicated without motion. Significantly different results occurred as a function of the presence or absence of motion. Implications of these results raise doubt concerning the validity of findings from simulator experiments in which whole-body acceleration cues might be a factor.
Author (GRA)

N73-13849* General Electric Co., Philadelphia, Pa. Missile and Space Div.
DOMESTIC APPLICATIONS FOR AEROSPACE WASTE AND WATER MANAGEMENT TECHNOLOGIES
Frank DiSanto and Robert W. Murray *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 221-230 refs (For availability see N73-13829 04-30)
CSCL 06I

N73-13850* International Business Machines Corp., Armonk, N.Y. Health Sciences.
BREATHING METABOLIC SIMULATOR
Roscoe G. Bartlett, Jr., C. M. Hendricks, and W. B. Morison *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 231-235 (For availability see N73-13829 04-30)
CSCL 06B

N73-13851* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
MEDICAL TECHNOLOGY ADVANCES FROM SPACE RESEARCH
Sam L. Pool *In its* Space for Mankind's Benefit 1972 p 237-244 refs (For availability see N73-13829 04-30)
CSCL 06B

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N73-13127 Institut d'Aeronomie Spatiale de Belgique, Brussels.
ABSORPTION BY MOLECULAR OXYGEN IN THE SCHUMANN-RUNGE BANDS [ABSORPTION PAR L'OXYGENE MOLECULAIR DANS LES BANDES DE SCHUMANN-RUNGE]
G. Kockarts 1972 219 p refs In FRENCH; ENGLISH summary (A-107-1972) Avail: Issuing Activity

The O2 absorption cross sections for the following temperatures and wavenumber ranges are presented: T = 180 K from 57030.5 cm/1 to 49711 cm/1 pp 1 - 61; T = 220 K from 57030.5 cm/1 to 49111 cm/1 pp 62 - 127; and T = 270 K from 57030.5 cm/1 to 48871 cm/1 pp 128 - 195. The cross section is given every 0.5 cm/1. Author

N73-13128* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIFFUSE REFLECTIVE COATING Patent
John W. Stuart, inventor (to NASA) Issued 14 Nov. 1972 4 p Filed 12 Feb. 1971 Supersedes N72-10137 (10 - 01, p 0021) (NASA-Case-GSC-11214-1; US-Patent-3,702,775; US-Patent-Appl-SN-115134; US-Patent-Class-117-35R) Avail: US Patent Office CSCL 11C

An improved non-specular diffuse, reflective coating is provided by coating a substrate with a composition of a highly reflective, crystalline inorganic salt and a liquid solvent having limited solvent activity for the salt, a non-solvent wetting agent, and a relatively volatile dispersant-drying agent, and drying the coating. Excellent results have been obtained when the salt is sodium chloride, the solvent is a diol with not more than one terminal hydroxy group, the non-solvent is xylene or toluene, and the drying agent is ethanol or isopropanol.
Official Gazette of the U.S. Patent Office

N73-13129* Radio Corp. of America, Princeton, N.J.
METHOD FOR DISTILLATION OF LIQUIDS Patent
Algerd Basiulis and Paul K. Shefsiek, inventors (to NASA) Issued 14 Nov. 1972 5 p Filed 14 Dec. 1970 Supersedes N72-13102 (10 - 04, p 0445) Continuation-in-part of US Patent Appl. SN-697075, filed 11 Jan. 1968 Sponsored by NASA (NASA-Case-XNP-08124-2; US-Patent-3,702,762; US-Patent-Appl-SN-97829; US-Patent-Class-75-66) Avail: US Patent Office CSCL 07D

A method for distillation of materials including liquid metals having at least one U-shaped tube with one upstream end connected to the device to which the purified metal is reported. The material to be purified is disposed in the base of the U while the upstream leg is surrounded with cooling coils for condensation, and the downstream leg has heating coils at a portion thereof for vaporization. The bottom reservoir portion of the U is heated. Between the reservoir portion and the upstream leg of the U within the device is a capillary tube to carry the heated material from the reservoir to the heated region. A series of these tubes can be connected together in continuous fashion to produce a fractional distillation.
Official Gazette of the U.S. Patent Office

N73-13130*# Colorado School of Mines, Golden. Chemical and Petroleum-Refining Engineering Dept.
THE EFFECT OF GRAVITY INDUCED FREE CONVECTION UPON THE MELTING PHENOMENA OF A FINITE PARAFFIN SLAB FOR THERMAL CONTROL Annual Summary Report, 21 Nov. 1968 - 30 Jun. 1971
R. L. Bain, F. J. Stermole, and J. O. Golden 21 Jan. 1972 97 p refs
(Contract NAS8-30511; Contracts CSM-F-6911; CSM-F-6915) (NASA-CR-123954; ASR-1; CSM-CPR-R172) Avail: NTIS HC $7.00 CSCL 07D

Two theoretical models were developed to predict the thermal response of the phase change material to a given hot plate temperature. A two-dimensional pure conduction model was developed to predict the melting of the phase change material when heat transfer was a function of conduction. A combined conduction-convection model, also two-dimensional, was developed to predict the phase change phenomena when heat transfer was a function of conduction and gravity-induced free convection. Both models were solved using explicit finite difference approximations on a digital computer. The experimental equipment consisted of a rectangular cell utilizing a heat chamber, an expansion chamber, and a test chamber; a sixteen channel multipoint recorder; and a fluid flow system. The recorder monitored hot and cold plate temperatures and interior node temperatures at two-second intervals. A comparison of theoretical temperature profiles and experimental temperature profiles is presented for six runs at various angles of inclination of the test cell with respect to the horizontal direction. A detailed discussion of results is presented. Author

N73-13131*# Colorado School of Mines, Golden.
AN EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THE LIQUEFACTION DYNAMICS OF A PHASE CHANGE MATERIAL IN A NORMAL GRAVITY ENVIRONMENT Annual Summary Report, 21 Nov. 1970 - 31 Dec. 1971
R. L. Bain, F. J. Stermole, and J. O. Golden 21 Jan. 1972 113 p refs
(Contract NAS8-30511)
(NASA-CR-129911; ASR-2; CSM-CPR-R272) Avail: NTIS HC $7.75 CSCL 07D

Experimental and theoretical investigations were undertaken to determine the role of gravity-induced free convection upon the liquefaction dynamics of a cylindrical paraffin slab under normal gravity conditions. The experimental equipment consisted of a test cell, a fluid-loop heating system, and a multipoint recorder. The test chamber was annular in shape with an effective radius of 1.585 cm and a length of 5.08 cm. The heating chamber was a 1.906 cm diameter tube going through the center of the test chamber, and connected to the fluid loop heating system. All experimental runs were made with the longitudinal axis of the test cell in the vertical direction to insure that convection was not a function of the angular axis of the cell. Ten melting runs were made at various hot wall temperatures. Also, two pure conduction solidification runs were made to determine an experimental latent heat of fusion. Author

N73-13132*# Colorado School of Mines, Golden.
THERMAL MODELING OF PHASE CHANGE SOLIDIFICATION IN THERMAL CONTROL DEVICES INCLUDING NATURAL CONVECTION EFFECTS Annual Summary Report, 21 Nov. 1970 - 31 Dec. 1971
A. O. Ukanwa, F. J. Stermole, and J. O. Golden 26 Jan. 1972 119 p refs
(Contract NAS8-30511)
(NASA-CR-129910; ASR-2; CSM-CPR-R372) Avail: NTIS HC $8.00 CSCL 07D

Natural convection effects in phase change thermal control devices were studied. A mathematical model was developed to evaluate natural convection effects in a phase change test cell undergoing solidification. Although natural convection effects are minimized in flight spacecraft, all phase change devices are ground tested. The mathematical approach to the problem was to first develop a transient two-dimensional conduction heat transfer model for the solidification of a normal paraffin of finite geometry. Next, a transient two-dimensional model was developed for the solidification of the same paraffin by a combined conduction-natural-convection heat transfer model. Throughout the study, n-hexadecane (n-C16H34) was used as the phase-change material in both the theoretical and the experimental work. The models were based on the transient two-dimensional finite difference solutions of the energy, continuity, and momentum equations. Author

N73-13133*# Colorado School of Mines, Golden. Dept. of Chemical and Petroleum-Refining Engineering.
AN EXPERIMENTAL AND THEORETICAL EVALUATION OF INCREASED THERMAL DIFFUSIVITY PHASE CHANGE DEVICES Annual Summary Report, 21 Jan. 1971 - 31 Jan. 1972
S. P. White, J. O. Golden, and F. J. Stermole 2 Mar. 1972 118 p refs
(Contract NAS8-30511)
(NASA-CR-129909; ASR-1; CSM-CPR-R472) Avail: NTIS HC $8.00 CSCL 07D

This study was to experimentally evaluate and mathematically model the performance of phase change thermal control devices containing high thermal conductivity metal matrices. Three aluminum honeycomb filters were evaluated at five different heat flux levels using n-oct-adecane as the test material. The system was mathematically modeled by approximating the partial differential equations with a three-dimensional implicit alternating direction technique. The mathematical model predicts the system quite well. All of the phase change times are predicted. The heating of solid phase is predicted exactly while there is some variation between theoretical and experimental results in the liquid phase. This variation in the liquid phase could be accounted for by the fact that there are some heat losses in the cell and there could be some convection in the experimental system.
Author

N73-13134*# Cornell Univ., Ithaca, N.Y.
DETECTION OF SOIL MICROORGANISMS IN SITU BY COMBINED GAS CHROMATOGRAPHY MASS SPECTROMETRY Project Report, 1 Sep. 1971 - 31 Aug. 1972
M. Alexander, J. M. Duxbury, A. J. Francis, and J. Adamson 31 Aug. 1972 28 p refs
(Grant NGR-33-010-127)
(NASA-CR-129602) Avail: NTIS HC $3.50 CSCL 08M

Experimental tests were made to determine whether analysis of volatile metabolic products, formed in situ, is a viable procedure for an extraterrestrial life detection system. Laboratory experiments, carried out under anaerobic conditions with addition of carbon source, extended to include a variety of soils and additional substrates. In situ experiments were conducted without amendment using a vacuum sampling system. Author

N73-13135# Royal Aircraft Establishment, Farnborough (England).
VIBRATION-DAMPING PLASTICS FROM OPTIMALLY COMPOSED POLYMERS
H. Oberst Sep. 1972 38 p refs Transl. into ENGLISH from Kolloid-Z. (Darmstadt), no. 216-217, 1968 p 64-80
(RAE-Lib-Trans-1646) Avail: NTIS HC $4.00

Vibration damping plastics which are used as damping layers in systems of laminae, find a technological use in the field of noise abatement. The relationship between frequency dependence and temperature dependence of their visco-elastic properties under vibrating loads is investigated, and information is obtained on the temperature regions in which the materials show high damping effectiveness. By mixing the materials or by copolymerization of suitably chosen components, polymeric damping materials are prepared which possess an optimum damping effect in specified temperature regions. These visco-elastic properties, especially the damping of combined systems of sheets and damping layers, have been fully investigated and it is possible to design a combined system to optimal damping in specified temperature regions. Systems of layers with damping coating on one side and bonded sheet systems, consisting of external sheets and an intermediate damping layer, are discussed in detail. Author

N73-13136# Chemical Lab. RVO-TNO, Rijswikj (Netherlands).
LITHIUM HYDROXIDE FOR THE REMOVAL OF CARBON DIOXIDE: A LITERATURE SURVEY
R. H. Barents Jul. 1971 24 p refs In DUTCH; ENGLISH summary
(CL-1971-15) Avail: NTIS HC $3.25

LiOH, Li2O and combinations of LiOH with oxides of other alkali metals absorb CO2. The results of a literature search on the conditions that govern the removal of CO2 from gases are given. The relative humidity plays an important role in the removal of CO2 by LiOH. Author

N73-13137*# National Aeronautics and Space Administration, Washington, D.C.
ON THE POSSIBILITY OF QUANTITATIVE ASSAY OF HYDRAZINE, ITS SPLITTING PRODUCTS, AND ITS IMPURITIES
E. Santacesaria and L. Giuffre Dec. 1972 18 p refs Transl. into ENGLISH from Riv. Combust. (Milan), v. 23, no. 9, 1969 p 438-447
(NASA-TT-F-14722) Avail: NTIS HC $3.00 CSCL 07D

A gas chromatography method is proposed for performing a quantitative assay of hydrazine and its usual splitting products, N2, NH3 and H2. The method is based on the use of two switchable gas chromatography columns; water and hydrazine are assayed on one nitrogen and ammonia on the other. Since hydrogen is generated by the splitting of hydrazine, it is assayed by a differential calculation from the known conversion patterns of hydrazine, after having settled the matter of the nitrogen balance. It has no influence on the nitrogen assay, since hydrogen is always employed as carrier gas. The method in question has been used for a check-up of the hydrazine break down reaction stoichiometrics on some laboratory-made catalysts. Author

N73-13138*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DISSOCIATION ENERGIES OF SOME HIGH TEMPERATURE MOLECULES CONTAINING ALUMINUM
Carl A. Stearns and Fred J. Kohl Washington Dec. 1972 30 p refs
(NASA-TN-D-7123; E-6963) Avail: NTIS HC $3.00 CSCL 20H

The Knudsen cell mass spectrometric method has been used to investigate the gaseous molecules Al2, AlSi,AlSiO, AlC2, Al2C2, and AlAuC2. Special attention was given to the experimental considerations and techniques needed to identify and to measure ion intensities for very low abundance molecular species. Second- and third-law procedures were used to obtain reaction enthalpies for pressure calibration independent and isomolecular exchange reactions. Dissociation energies for the molecules were derived from the measured ion intensities, free-energy functions obtained from estimated molecular constants, and auxiliary thermodynamic data. The bonding and stability of these aluminum containing molecules are compared with other similar species.
Author

N73-13139# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
LIQUID DENSITIES OF OXYGEN, NITROGEN, ARGON, AND PARAHYDROGEN
H. M. Roder, R. D. McCarty, and V. J. Johnson Oct. 1972 182 p refs Revised
(NBS-TN-361-Rev) Avail: SOD $1.25 as C13.46:361 (Revised)

Tables of pressure, volume, density and temperature for the saturated liquid and for compressed liquid states from the triple point to the critical point of oxygen, nitrogen, argon, and parahydrogen are presented. The table entries of temperature are in Kelvin and Rankine, table entries in pressure are in atmospheres and psia. Volumes or densities are given in several different units, and density ratios or volume correction factors are tabulated for each entry. Estimates of the uncertainty for the tabulated data are given. The tables and graphs were prepared in the style and in the units preferred by users. Author

N73-13140*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PREPARATION OF THIN FILM SILVER FLUORIDE ELECTRODES FROM CONSTITUENT ELEMENTS
Patricia M. ODonnell Washington Dec. 1972 10 p refs
(NASA-TM-X-2690; E-7040) Avail: NTIS HC $3.00 CSCL 07D

The feasibility of preparing thin-film metal fluoride electrodes from the elemental constituents has been demonstrated. Silver fluoride cathodes were prepared by deposition of silver on a conducting graphite substrate followed by fluorination under controlled conditions using elemental fluorine. The resulting electrodes were of high purity, and the variables such as size, shape, and thickness were easily controlled. Author

N73-13141*# Scientific Translation Service, Santa Barbara, Calif.
CHEMICAL TRANSFORMATIONS IN A HYDROGEN-AIR MIXING LAYER
Otto Leuchter Washington NASA Dec. 1972 9 p refs Transl. into ENGLISH from the French report ONERA-TP-981
(Contract NASw-2035)
(NASA-TT-F-14633; ONERA-TP-981) Avail: NTIS HC $3.00 CSCL 07D

Chemical evolution in an air-hydrogen mixing layer was investigated. The confluence of two parallel flows of air and hydrogen was examined numerically in order to determine the conditions of self-ignition in the mixing layer. The calculations showed that the reaction zone is limited to the stoichiometric region. For the two streams at the same temperature, the ignition length can be evaluated by neglecting the effects of lateral diffusion. Author

N73-13142# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
DYNAMIC SUSCEPTIBILITY OF A MODEL POLYMER IN SEVERAL LIMITS: THEORY AND CALCULATIONS
M. J. Mandell Apr. 1972 51 p refs
(Contract AT(11-1)-3161)
(COO-3161-2) Avail: NTIS

The susceptibility of a model polymer having rotating dipolar sidechains with nearest neighbor interactions and diagonal viscosity was studied. The susceptibility can be found exactly (1) at zero frequency for arbitrary interaction strength, and (2) at zero interaction strength for arbitrary frequency and viscosity. In addition, a high temperature expansion exists for arbitrary frequency both in the viscous limit and for finite viscosity. The time dependent correlation function for arbitrary viscosity and weak interaction and the possibility of a more complex diagonal friction law was also studied. In no case was a Cole-Cole plot which approaches the orgin with finite slope at high frequencies produced as it is in most experimental data. Author

N73-13143# California Univ., Berkeley. Dept. of Chemistry.
LASER STUDIES OF MOLECULAR ENERGY TRANSFER IN GASES Final Technical Report, 1 Jul. 1971 - 30 Jun. 1972
C. Bradley Moore 15 Jul. 1972 4 p refs
(Contract DAHC04-71-C-0047)
(AD-748858; AROD-9782-5 P) Avail: NTIS CSCL 07/4

Very briefly discussed is research concerning laser studies of vibrational energy transfer for systems of importance in understanding the kinetics and performance of chemical and molecular lasers. GRA

N73-13144# Grumman Aerospace Corp., Bethpage, N.Y.
MELTING CHARACTERISTICS AND BULK THERMOPHYSICAL PROPERTIES OF SOLID HYDROGEN Final Technical Report, Jul. 1971 - May 1972
William Contreras and Mansuk Lee Jul. 1972 132 p refs
(Contract F04611-71-C-0063)
(AD-748847; AFRPL-TR-72-48) Avail: NTIS CSCL 07/4

The experimental determination of the melting characteristics of solid hydrogen has been accomplished. This required the measurements of appropriate thermodynamic parameters, thermophysical properties and fluid flow rates required to characterize the melting of solid hydrogen in terms of an overall heat transfer coefficient, operating conditions and initial solid geometry. Correlations for both melting characteristics and thermophysical properties (K, alpha) are given. It was found that favorable thermophysical properties of solid hydrogen contributed to a relatively fast melting rate. A comparison of the thermal conductivity obtained from the experimental solid with reported measurements for crystals reveals a significant reduction attributed to mechanical imperfections.
Author (GRA)

N73-13145# TRW Systems Group, Redondo Beach, Calif.
CHEMICAL REACTIONS KINETICS WITH METALLIC ATOMS Final Report, 14 Apr. 1969 - 14 Jun. 1972
David O. Hansen, Joseph F. Friichtenicht, and John M. Sellen, Jr. 14 Jun. 1972 87 p refs
(Contract F19628-69-C-0238; AF Proj. 5710)
(AD-748278; TRW-11370-6009-RO-81; AFCRL-72-0366) Avail: NTIS CSCL 07/4

The report describes research to develop a pulsed atomic beam by the laser vaporization of high velocity microparticles and to use the pulsed atomic beam to measure several metal monoxide formation cross sections. An experimental system for irradiating high velocity particles was designed, built, and tested. Tests confirmed that the particles were vaporized by the laser bombardment, but the thermal (random) velocity distribution of vaporized atoms and ions resulted in a much lower than anticipated useful beam intensity. As an alternative approach, the laser bombardment of solid metallic targets was used to produce both ionic and atomic pulsed beams. Useful beam intensities were obtained for both ions and atoms of uranium, thorium, aluminum, and iron. Generally, the entire energy spectrum was present in each pulse. Using time-of-flight techniques to specify the incident beam energy, cross sections for the reactions U(-) - O2 to UO(-) - O and Th(-) - O2 to ThO(-) - O were measured. Author (GRA)

N73-13146# Aerospace Corp., El Segundo, Calif. Lab. Operations.
MONTE CARLO CALCULATIONS OF REACTION RATES AND ENERGY DISTRIBUTIONS AMONG REACTION PRODUCTS F AND H2 YIELDS HF AND H
Roger L. Wilkins 15 Sep. 1972 32 p refs
(Contract F04701-72-C-0073)
(AD-748291; TR-0073(3430)-3; SAMSO-TR-72-206) Avail: NTIS CSCL 07/4

A three-dimensional, classical trajectory calculation is made of the collision dynamics of the reaction F - H2(v,J) to HF(v,J) - H by means of the London-Eyring-Polanyi-Sato (LEPS) potential energy surface. Monte Carlo procedures are used to start each collision trajectory. A discussion is presented of the temperature dependence of the relative rates of formation of vibrationally excited hydrogen fluoride. By means of this calculation, it can be predicted that 71% of the mean fraction of available energy will become vibration in HF, 10.5% will become rotation in HF, and 18.5% will become translation in the product. Reaction rate constants are presented for reaction directly into specific vibrational and rotational states of the product HF molecule.
GRA

N73-13147# Naval Ordnance Lab., White Oak, Md.
LITHIUM AS AN ANODE IN CONCENTRATED AQUEOUS LITHIUM CHLORIDE SOLUTIONS: A FEASIBILITY STUDY Final Report
Judith H. Ambrus and Elmer Gubner 18 Aug. 1972 24 p refs
(AD-749009; NOLTR-72-138) Avail: NTIS CSCL 07/4

The anodic efficiency of lithium in the Li/LiCl(aq)/AgCl system was measured as a function of electrolyte concentration (at 5.042, 10.05, and 13.82 m) temperature (-15, -25, and -35C) and current density (5 to 35 ma/sq cm). The anodic efficiency increases sharply with increasing concentration. Small increases in the anodic efficiency can be seen with increasing current densities and decreasing temperatures. The voltage of the system is close to the theoretical voltage indicating that only small polarization effects are present. The study has demonstrated that the system would be feasible for the development of a high energy density, low temperature reserve battery.
Author (GRA)

N73-13148# Case Western Reserve Univ., Cleveland, Ohio. Ultrasonics Research Lab.
BRILLOUIN SCATTERING IN AQUEOUS ELECTROLYTE SOLUTIONS
Arthur R. Maret and Ernest Yeager 1 Jul. 1972 32 p refs
(Contract N00014-67-A-0404-0004; NR Proj. 384-305)
(AD-749354; TR-40) Avail: NTIS CSCL 07/4

Brillouin scattering studies have been carried out in a number of aqueous electrolyte solutions at various concentrations up to 4 M. Two types of results have been obtained: hypersonic velocity data from the frequency shift of the Brillouin components; and hypersonic absorption coefficients from the line widths of the Brillouin components. The results compare favorably with those from ultrasonic velocity and absorption data at lower frequencies.
Author (GRA)

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N73-13149* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
APPARATUS FOR DERIVING SYNCHRONIZING PULSES FROM PULSES IN A SINGLE CHANNEL PCM COMMUNICATIONS SYSTEM Patent
Lucien A. Couvillon, Jr., Christopher Carl, Richard M. Goldstein, Edward C. Posner, and Richard R. Green, inventors (to NASA) Issued 31 Oct. 1972 23 p Filed 11 Sep. 1970 Supersedes N72-11160 (10 - 02, p 0169) Sponsored by NASA
(NASA-Case-NPO-11302-1; US-Patent-3,701,894; US-Patent-Appl-SN-70967; US-Patent-Class-235-181; US-Patent-Class-178-69.5; US-Patent-Class-235-150.53; US-Patent-Class-325-325; US-Patent-Class-340-146.1) Avail: US Patent Office CSCL 17B

A method and apparatus is disclosed for bit synchronization of a received PCM communications signal, without requiring a separate synchronization channel in the communications signal by digital correlation. Each phase displaced replica is correlated with the input signal to determine which phase displaced replica produces the largest correlation signal. In carrying out the correlation of the square wave signal with a given phased displaced replica, the two levels of the replica corresponding to the +1 and -1 binary values of the input signal are employed as sign signals to control the arithmetic addition or subtraction of the input signal binary values. The binary values of the input signal are produced by means for sampling and converting the input signal into +1 and -1 values.

Official Gazette of the U.S. Patent Office

N73-13150# Communications Research Centre, Ottawa (Ontario).
THE EXCITATION OF RESONANCES BY A DIPOLE ANTENNA INSIDE A HOLLOW CYLINDRICAL PLASMA
G. L. Yip Jun. 1972 21 p refs Presented at the URSI Symp. on Waves and Resonances in Plasmas, St. Johns, Newfoundland, 4-8 Jul. 1971
(CRC-1230) Avail: NTIS HC $3.25

The plasma is assumed to be cold, uniform, isotropic, and lossy. A transversely oriented infinitesimally short electric dipole antenna lying on the axis of the cylindrical plasma is the source under consideration. For a thin and lossless plasma, resonances are found to occur at the two frequencies corresponding to dipolar resonances in a hollow cylindrical plasma. In addition, there is also an anti-resonance at the plasma frequency. The radiation resistance and radiation patterns of the plasma-covered dipole are presented to show the effects of the radii of the plasma tube, the signal frequency, and the collision frequency. Author

N73-13151# Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Applied Chemistry.
A RADAR STUDY OF THE SMOKE PLUME FROM A FOREST FIRE
D. G. Reid and R. G. Vines 1972 14 p refs
(Div-Appl-Chem-TP-2) Avail: NTIS HC $3.00

The development of the smoke cloud from a summer wildfire in a forest area was studied on a radar screen. In conjunction with photographs taken at the same time, it has been possible to follow the variations in height of both the top and bottom of the smoke column as it was blown downwind; estimates of the rate of rise of the smoke, at different heights, were also obtained. The general behavior of the smoke cloud is interpreted in terms of the prevailing winds and the lapse rate in the surrounding air. Author

N73-13152# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NONLINEAR MAGNETOSONIC WAVES PROPAGATING IN A MAGNETIC NEUTRAL SHEET
Jun-ichi Sakai Oct. 1972 37 p refs
(IPPJ-139) Avail: NTIS HC $4.00

Nonlinear magnetosonic waves propagating in a magnetic neutral sheet are investigated within the framework of a fluid model. It is shown that the magnetosonic waves are governed by a modified Burgers equation with an additional term due to the relevant slowly varying background plasma parameter (density or magnetic field). Fast magnetosonic waves propagating toward the neutral region across the magnetic field grow and undergo rapid steepening after passing through the neutral region; i.e., shock formation is promoted by the background inhomogeneity. A numerical computation examines the time evolution for two initial disturbances, the pulse type (Gaussian) and the wave train type (sinusoidal wave). Author

N73-13153# Comision Nacional de Investigaciones Espaciales, Buenos Aires (Argentina).
STUDY OF A RADIO TELEMETRY SYSTEM FOR DETECTION AND TRACKING OPERATING IN THE FREQUENCY BANDS FROM 216 TO 260 MHz FOR USE WITH ROCKET AND SPHERICAL SONDES [ESTUDIO DE UN SISTEMA RADIOTELEMETRICO DE BUSQUEDA Y SEGUIMIENTO OPERANDO EN LA BANDA DE 216 A 260 MHz PARA SER EM PLEADO EN COHETES O GLOBOS SONDA]
R. M. Caja! 1971 18 p In SPANISH
(Rept-11) Avail: NTIS HC $3.00

The transmission of information from a rocket to the ground was studied to develop experimental prototype circuits for flight tests. The circuits were used in various launches, and their performance was evaluated. Transl. by F.O.S.

N73-13154# Transportation Systems Center, Cambridge, Mass.
ASDE-2 TRANSMITTER MODIFICATIONS Final Report
Henry R. Guarino Sep. 1972 30 p refs
(FA-221)
(FAA-RD-72-82; DOT-TSC-FAA-72-16) Avail: NTIS HC $3.50 CSCL 17I

The engineering inadequacies that caused ASDE-2 radar failures at various airports are examined. Statistical analysis revealed that the preponderance of these failures orginated in the modulator-transmitter section where the mean time between failures was controlled by the following interrelated factors: (1) an undersized hydrogen thyratron driver for the power amplifier, (2) an inadequate trigger pulse amplifier output, and (3) poor operating conditions for the power amplifier tubes. The modifications made to one channel of radar are described and the resulting performance improvements are given. Author

N73-13155# IIT Research Inst., Annapolis, Md.
ANALYSIS OF FACTORS AFFECTING ELECTROMAGNETIC COMPATIBILITY OF RADARS OPERATING IN THE 2700 TO 2900 MHz BAND Final Report
Michael A. Maiuzzo Electromagnetic Compatibility Analysis Center Jul. 1972 190 p refs
(Contracts DOT-FA70WAI-175; F19628-71-C-0221)
(ECAC-PR-71-033; FAA-RD-71-91) Avail: NTIS HC $11.50

The effect of selected technical and operational considerations on the electromagnetic compatibility of present and projected deployments of radars in the 2.7 to 2.9 GHz frequency band is analyzed. The spectrum channel width relationship to transmitter power amplifier characteristics and pulse waveform parameters is explored. The results of assigning discrete channels for individual radars are presented. Author

N73-13156# Joint Publications Research Service, Arlington, Va.
RADAR IMAGE OF THE SURFACE OF THE SEA
S. D. Yeshchenko and B. Sh. Lande 2 Nov. 1972 13 p refs Transl. into ENGLISH from Radiotekh. Elektron. (Moscow), no. 8, 1972 p 1590-1597
(JPRS-57409) Avail: NTIS HC $3.00

Data are reported from a theoretical investigation of the scattering of radio waves in the centimeter range by the water surface in various hydrological and meteorological conditions. The results of airborne and seaborne experiments in the fixation of radar image for various hydrometeorological conditions.

Author

N73-13157*# Bell Aerospace Co., Buffalo, N.Y.
RADAR ATTITUDE SENSING SYSTEM (RASS) Final Report, Aug. 1970 - Feb. 1971

Feb. 1971 104 p refs
(Contract NAS9-11015)
(NASA-CR-128684; Rept-6027-933001; BAC-0345A-Rev-268)
Avail: NTIS HC $7.25 CSCL 17I

The initial design and fabrication efforts for a radar attitude sensing system (RASS) are covered. The design and fabrication of the RASS system is being undertaken in two phases, 1B1 and 1B2. The RASS system as configured under phase 1B1 contains the solid state transmitter and local oscillator, the antenna system, the receiving system, and the altitude electronics. RASS employs a pseudo-random coded cw signal and receiver correlation techniques to measure range. The antenna is a planar, phased array, monopulse type, whose beam is electronically steerable using diode phase shifters. The beam steering computer and attitude sensing circuitry are to be included in Phase 1B2 of the program. Author

N73-13158# Lockheed Missiles and Space Co., Palo Alto, Calif.
INFORMATION PROCESSING IN A RADAR SYSTEM
D. S. Kontorov and Iu. S. Golubev-Novozhilov [1972] 18 p refs Transl. into ENGLISH from the book "Vvedenie v Radiolokatsionnuiu Sistemotekhniku" Sovetskoe Radio, Moscow, 1971 p 89-112
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The theory and technique of processing radar station information using analog and digital computers is considered by estimating quality indices and determining parameters through analyses of signals received by the radar system. Subdivision into different processing schemes, where each subproblem is associated with conversion of the input signal or decision making, provides correct solutions if the confidence of each decision making process is estimated on the basis of a priori data, and these confidence estimates are taken into account in all processing steps with subsequent decision making. The probabilities of a correct solution, the statistical characteristics of the measurements and calculation errors, as well as the processing parameters such as the limitation level, the signal phase, and its law of variation during detection, etc., are used as estimates. Some characteristic processing schemes with multiple decision making are included. G.G.

N73-13159# Sandia Labs., Albuquerque, N.Mex.
TERRAIN-ECHO SPECTRUM OF A MOVING RADAR: SOME NUMERICAL RESULTS
Eugene A. Aronson and Charles S. Williams May 1972 28 p refs Sponsored by AEC
(SC-DR-720261) Avail: NTIS

The variation of radar altimeter return from the terrain due to motion of the radar is described by a Doppler spectrum. Conventional methods predict total spectral cutoff at the frequency limits $f \pm 2vf/c$ where f is the transmitted frequency and v is the radar velocity. Numerical results obtained from an improved method of calculating the spectrum are presented. Cutoff is not total at the conventional limits, but the spectral values are extremely low beyond them. Author

N73-13160# Bundesministerium fuer Bildung und Wissenschaft, Bonn (West Germany).
DIRECT TELEVISION RECEPTION VIA SATELLITES [FERNSEHDIREKTEMPFANG UEBER SATELLITEN]
A. H. Schendel and F. W. Bodemann (BMP, Bonn) 1972 17 p refs In GERMAN Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-50) Avail: NTIS HC $3.00

The technical and economic aspects of direct television reception from satellites are discussed for the coverage of Germany. The results of preliminary studies show that practically a 100 percent coverage of the Federal Republic can be obtained with one satellite of 800-1000 kg for 3-5 TV programs, a solar cell generator providing 1.2 kw/channel, a transmitter antenna with 1 deg aperture angle, transmitter power 500-800 w/channel, and development costs 600-800 million DM. The reception antennas should be 0.9 m diameter for private reception, and 2-3 m diameter for collective reception. The results are compared with terrestrial solutions (12 GHz transmitter network, cable TV networks), and are favorable. Author (ESRO)

N73-13161# Technische Hochschule, Graz (Austria). Inst. fuer Theoretische Physik und Reactorphysik.
WAVE PROPAGATION BETWEEN EARTH AND IONOSPHERE TAKING INTO ACCOUNT DIFFERENT REGIONS OF GROUND CONDUCTIVITY AND A VARIABLE HEIGHT OF THE IONOSPHERE Final Technical Report, Apr. 1971 - Mar. 1972
Ernst Ledinegg May 1972 102 p refs
(Contract DAJA37-71-C-3546)
(AD-746636; AROG(E)-E-1495) Avail: NTIS CSCL 20/14

It has been reported that VLF signals are sometimes damped severely when crossing the ice of Greenland under daylight conditions. This anomalous attenuation occurs simultaneously with a strong proton flux coming from the sun which is known to increase the ionization of the D-layer. In order to find a theoretical explanation of this effect, in the First Year Technical Report the propagation of the field of an electric dipole between earth and ionosphere is investigated. The model proposed consists of a spherical wave guide; the surface conductivity of the inner sphere corresponds to that of sea water except for a trapezoidal domain covered by ice, while the outer surface corresponds to the boundary of the ionosphere. Author (GRA)

N73-13162# Banaras Hindu Univ., Varanasi (India).
GENERATION AND PROPAGATION OF LOW FREQUENCY ELECTROMAGNETIC WAVES
R. N. Singh Dec. 1971 105 p refs
(Contract EOOAR-70-0070; AF Proj. 5631)
(AD-747092; AFCRL-72-0441; SR-3) Avail: NTIS CSCL 04/1

The general theory of energy attenuation of test charge particle in a cold and collisional plasma has been developed. The effects of collisions on plasma parameters have been brought about. The radiation characteristics of spiralling test particles have been discussed. In presence of collisions it is found that absorption is associated with radiation. Estimates of radiated and absorbed power by test charge of different energies have been made and the role of collision on the power spectrum has been studied. These effects are shown with the help of various graphs. Further, in the second part of the report the author has discussed the propagation of VLF waves radiated by Cerenkov process, especially in the whistler mode. GRA

N73-13163# Tamir (T.), Teaneck, N.J.
FREQUENCY DEPENDENCE OF RADIO LOSSES FOR RADAR SYSTEMS IN FOREST ENVIRONMENTS
T. Tamir Jul. 1972 34 p refs
(Contract DA-31-124-ARO(D)-120)
(AD-748104; LWL-CR-05P70) Avail: NTIS CSCL 17/9

The effects of changing the frequency of Doppler radar systems operating over bare ground or in a forest environment are explored for targets that are close to the ground. For this purpose, a criterion is formulated which enables a judicious comparison to be carried out between a system that operates at a reference frequency f sub 0 and another system that operates at a frequency f. Results are presented here for horizontally polarized fields over bare ground or in the presence of a forest. Author

N73-13164# Army Foreign Science and Technology Center, Charlottesville, Va.
REDUCING THE ANGLE FREQUENCY SENSITIVITY OF ANTENNAS BY MEANS OF COMPENSATED WAVEGUIDE CIRCUITS
A. I. Ardabevskii 11 Aug. 1972 20 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Radioelektron. (Kiev), v. 11, no. 5, 1968 p 495-510
(AD-748742; FSTC-HT-23-1029-72) Avail: NTIS CSCL 09/5

The angle-frequency properties of linear antenna arrays are studied for various radiator feed systems using channeling lines. It is demonstrated that with proper selection of parameters, the frequency deviation of a ray in a wave band can be significantly reduced. Author (GRA)

N73-13165*# Harry Diamond Labs., Washington, D.C.
AN ABSOLUTE MEASUREMENT PROCEDURE TO DETERMINE OSCILLATOR-DETECTOR SENSITIVITY AND POWER
Neil D. Wilkin Apr. 1972 61 p refs
(AD-748826; HDL-TR-1606) Avail: NTIS CSCL 17/2

A method of measuring the sensitivity and radiated power of oscillator-detector systems without the need for calibration with a pole test is presented. The measurement technique applies to both CW and modulated systems. The basic measuring technique is discussed, and then a rapid testing procedure, which requires chamber precalibration over the desired frequency range, is described. Reference is made to a novel standard loop antenna which has a 50-ohm driving impedance and is used in the measurement procedure. An error analysis is included which can be used to determine the accuracy of this technique.
Author (GRA)

N73-13166# Computer Sciences Corp., Falls Church, Va.
DSCP SOFTWARE IMPLEMENTATION OF GROUND STATIONS, VOLUME 1 Final Report
Sep. 1971 171 p 2 Vol.
(Contract DCA100-71-C-0012)
(AD-748881) Avail: NTIS CSCL 17/2

The report investigates methods whereby the largest possible number of ground station communications functions can be performed in a third generation mini-computer, and develops computerized implementations based on these methods. GRA

N73-13167# Computer Sciences Corp., Falls Church, Va.
DSCP SOFTWARE IMPLEMENTATION OF GROUND STATIONS, VOLUME 2 Final Report
Sep. 1971 198 p refs 2 Vol.
(Contract DCA100-71-C-0012)
(AD-748882) Avail: NTIS CSCL 17/2

Contents: TDMA implementation, Fast acquisition methods for TDMA, Antenna control, and Survey of computers. GRA

N73-13168# Stanford Research Inst., Menlo Park, Calif.
ELECTRONICALLY TUNABLE HIGH-POWER FILTER FOR INTERFERENCE REDUCTION IN AIR FORCE COMMUNICATION SYSTEMS Final Report, 21 Apr. 1971 - 21 May 1972
Arthur Karp and William B. Weir Aug. 1972 132 p
(Contract F30602-71-C-0255)
(AD-748810; RADC-TR-72-196) Avail: NTIS CSCL 17/2

A novel, high-Q, high-power VHF/UHF bandpass filter is described that is electronically tuned according to a binary logic. A high-Q, TEM-line resonator is distributively loaded with N independent capacitive irises, such that the opening and closing of switches within each iris makes its capacitance two-valued. Mathematical modeling and design relations were developed and a working, 512-channel (9 iris) bandpass filter was completed for the range 194 to 359MHz. GRA

N73-13169# Rensselaer Polytechnic Inst., Troy, N.Y. Mechanics Div.
ELASTIC SURFACE WAVES GUIDED BY CURVED THIN FILMS
H. F. Tiersten and R. C. Davis Aug. 1972 71 p refs
(Contract N00014-67-A-0117-0007)
(AD-748646; TR-6) Avail: NTIS CSCL 09/1

An approximation technique previously developed for straight elastic surface wave guides utilizing thin films is extended and applied to curved guides with large radius-to-guide-width ratios. The dispersion curves for the circular guides are obtained by employing approximate bound modes in place of the actual wave functions, which are not fully bound. This procedure is quite accurate for the determination of dispersion curves in the propagation range of interest. Nevertheless, since the actual wave functions are not fully bound, some radiation is always present in a curved guide. This radiation loss accompanying the approximate bound modes is evaluated. A critical radius-to-guide-width ratio, beyond which a calculation cannot be performed by the method employed, is defined, and it is shown that the radiation attenuation becomes prohibitively large even before this limiting ratio is reached. The problem of the lowest symmetric guided elastic surface wave in a straight guide incident on a curved guide in the shape of a quarter circle is treated and the transmitted and reflected waves are determined, including in the calculation only the two lowest modes in each region and the radiation attenuation associated with each mode. Author (GRA)

N73-13170# Naval Research Lab., Washington, D.C.
COMPUTER TECHNIQUES FOR PLANNING AND MANAGEMENT OF OTH RADARS Interim Report
James M. Headrick, Joseph F. Thomason, Donald L. Lucas, and J. L. Lloyd Sep. 1972 37 p refs Prepared in cooperation with Office of Telecommunications, Boulder, Colo.
(AD-748588; NRL-MR-2500) Avail: NTIS CSCL 17/9

Techniques are described for the prediction and analysis of OTH radar operation. A complete ionospheric description is included and optimal computer techniques are utilized to give a practical means to handle the frequency- and antenna-scan management of the radar. Actual data are analyzed to show how the backscatter response from one frequency radar sounding can be used to derive the actual transmission-path characteristics that need to be known for effective radar operation.
Author (GRA)

N73-13171# Naval Electronics Lab. Center, San Diego, Calif.
HEIGHT OF SHIPBOARD ANTENNA AS A FACTOR IN SHIP-TO-AIR UHF COMMUNICATION COVERAGE, A HANDBOOK
R. L. Goodbody 26 Jun. 1972 134 p refs
(SF14222004)
(AD-748203; NELC-TD-184) Avail: NTIS CSCL 17/2

A computer analysis shows how 250-mile and 500-mile UHF free-space coverage contours are modified by reflections from smooth seawater for various ship antenna heights. The results are plotted for ship antenna heights between 50 and 200 feet above the waterline at 10-foot intervals. Frequencies considered are 225, 250, 275, and 300 MHz, which adequately represent the band normally used for ship-to-air naval communications. Author (GRA)

N73-13172# Naval Research Lab., Washington, D.C.
RADIATION PARAMETERS OF THE VLF TRANSMITTING STATION NPM, LUALUALEI, HAWAII Final Report
Edward E. Barr and John E. Raudenbush Aug. 1972 39 p refs
(AD-748177; NRL-MR-2475) Avail: NTIS CSCL 17/2

The radiation parameters were determined at five test frequencies; 14.7, 16.6, 19.8, 23.4, and 28.5 kHz, with the transmitting antenna operating in a dual or parallel east and west array configuration and in a single east array. The parameters were also determined for the antenna system operating in a single west array configuration for four frequencies; 16.6, 19.8, 23.4, and 28.5 kHz. A test to determine the possible onset of corona losses was performed with the dual array operating at 14.7 kHz, 23.4 kHz, and 28.5 kHz test frequencies. The values for the radiation parameters as well as the results of the corona tests are reported and discussed herein, along with a detailed description of the experimental techniques and data reduction process. Author (GRA)

N73-13173# Admiralty Surface Weapons Establishment, Portsmouth (England).
TRACKING STUDY: AN INTRODUCTION TO THE USE OF KALMAN FILTERS
A. L. C. Quigley Apr. 1972 75 p refs
(AD-747696; ASWE-TR-72-14; BR29879) Avail: NTIS CSCL 17/9

It is shown that Kalman filtering may be applied to the radar track-while-scan problem. No attempt is made to rigorously derive the Kalman equations, but the equations are related to more familiar ideas. It is demonstrated that the least squares alpha beta equations constitute a special case of the Kalman filter. The approach used, however, does not require a constant data rate or constant measurement accuracy, meaning that information from various sensors (including links) may be used.
Author (GRA)

N73-13174# Radiation, Inc., Melbourne, Fla.
ADAPTIVE PROCESSING FOR ANTENNA ARRAYS Final Report, Mar. 1971 - Mar. 1972
Charles A. Baird, Jr., George G. Rassweiler, Charles L. Zahm, and G. Patrick Martin Griffiss AFB, N. Y. RADC Jul. 1972 324 p refs
(Contract F30602-71-C-0173)
(AD-748220; RADC-TR-72-174) Avail: NTIS CSCL 09/5

The report reviews the background of adaptive arrays and formulates the basic structure of the array and environment under

consideration. Appropriate performance criteria and the derivation of the associated optimal solutions are presented. For very narrowband problems it is shown that the solutions differ only by a scalar gain, and thus have the same output signal-to-noise ratios. Iterative-adaptive computation procedures are then presented, from which it is obvious that a stochastic approximation-steepest gradient algorithm is best suited for real-time arrays. Within the context of this background, the adaptive algorithms which have been presented previously are discussed and compared. From this analysis it is obvious that the most promising algorithms are essentially equivalent. The behavior of the basic LMS type algorithm is analyzed, primarily by the solution of the associated differential equations. Author (GRA)

N73-13175# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
INVESTIGATION OF TARGET TRACKING ERRORS IN MONOPULSE RADARS Final Technical Report, May 1971 - Jul. 1972
George W. Ewell, Neal T. Alexander, and Edwin L. Tomberlin Jul. 1972 27 p refs
(Contract DAAH01-71-C-1192)
(AD-748428; GIT-A-1336-F) Avail: NTIS CSCL 17/9

The report discusses investigations of tracking errors associated with a particular monopulse phased-array radar system, called the Experimental Array Radar (EAR). The free-space performance of the EAR is first analyzed and degradations of performance due to particular target Doppler shifts and multipath returns are noted. A computer analysis of the tracking performance of the EAR is then presented, and it is noted that there are significant tracking errors due to multipath returns for targets at altitudes less than 1200 feet. An analysis of the effectiveness of frequency-agile operation in reducing the effects of these multipath returns is presented, and shows that the available frequency-agility bandwidth of a modified EAR would significantly reduce multipath-induced tracking errors, particularly for higher antenna and target locations. Improved MTI filters which provide more nearly uniform responses for a wide range of Doppler frequencies are then discussed and a number of representative improved filter responses presented.
Author (GRA)

N73-13176# Florida Univ., Gainesville. Communication Sciences Lab.
EVALUATION OF HELIUM SPEECH UNSCRAMBLERS UNDER CONTROLLED CONDITIONS
Harry Hollien, Howard B. Rothman, and Stephen Feinstein 1 Jul. 1972 20 p refs
(Contract N00014-68-A-0173-0008; NR Proj. 196-114)
(AD-748295; CSL/ONR-46) Avail: NTIS CSCL 17/2

In order to evaluate the effectiveness of HeO2 unscramblers, a four-part project was undertaken: To evaluate available unscramblers on-line; to test them off-line; to develop a standardized off-line test for the evaluation of all types of unscramblers; and to establish guidelines for the development of optimum equipment of this type. The report provides the results of two evaluations of a number of unscramblers. The first evaluation was conducted on-line during the training of Sea Lab-3 aquanauts at EDU; it was followed by an off-line (bench) test. Also described is a test consisting of 57 word-lists that have been developed for standardized off-line evaluations of electronic aids to speech communication in HeO2/P environments.
GRA

N73-13177# IIT Research Inst., Chicago, Ill.
ELF EARTH RETURN CIRCUIT ELECTROMAGNETIC FIELDS AND THEIR SIMULATION
A. R. Valentino Oct. 1971 26 p refs
(Contract N00039-71-C-0111; IITRI Proj. E6185)
(AD-748303; IITRI-E6185-TM-4) Avail: NTIS CSCL 06/18

Concepts and techniques useful for producing electric fields in conductive media at extremely low frequencies are described. Equations are given to aid in design and construction. The electric fields simulate those expected from a Sanguine communications system. Author (GRA)

N73-13178# Northwestern Univ., Evanston, Ill. Dept. of Electrical Engineering.
ON APPLICATION OF GRAPH THEORY TO NETWORKS AND CODING PROBLEMS SUCH AS ENCOUNTERED IN COMMUNICATION SYSTEMS Interim Scientific Report, 1 Jul. 1971 - 30 Jun. 1972
S. L. Hakimi 28 Aug. 1972 10 p refs
(Grant AF-AFOSR-2103-71; AF Proj. 9749)
(AD-748290; AFOSR-72-1704TR) Avail: NTIS CSCL 17/2

A summary of research progress by the author and his coworkers on various areas of applied graph theory is presented. The research problems considered during this year can be broadly classified into the following three major areas: (1) communication networks with particular emphasis in their vulnerability and survivability; (2) design and analysis of linear and nonlinear circuits with particular emphasis on computer aided design: and (3) topics in pure and applied graph theory. The report contains a brief description of the results obtained in each of these three areas, identifies possible generalizations and further applications, and provides a list of publications containing the detailed research results.
Author

N73-13179# IIT Research Inst., Chicago, Ill.
VHF-FM MULTICHANNEL EQUIPMENT SITING CONSIDERATIONS
T. Lesniakowski Apr. 1972 108 p refs
(Contract F19628-71-C-0221)
(AD-749186; ESD-TR-72-011) Avail: NTIS CSCL 17/2

Two Marine Corps VHF-FM radio equipments are analyzed to determine the constraints to be placed on their use when tactically deployed. The equipments are the AN/TRC-166, (AN/PRC-25 Manpack Radio with the AN/PCC-1 four-channel multiplex Telegraph-Telephone Terminal Set), and the AN/MRC-109 Vehicle-Mounted Radio Set with either the four-channel AN/VCC-1 (AN/MRC-134) or the eight-channel AN/VCC-2 (AN/MRC-135) multiplex Telegraph-Telephone Terminal Sets. Procedures that incorporate knowledge of terrain, path loss and frequency-distance separation criteria are developed to assist communicators in the selection of frequencies for operation of AN/MRC-134/135 and AN/TRC-166 VHF-FM radios in the field. Author (GRA)

N73-13180# Harry Diamond Labs., Washington, D.C.
PULSE POSITION MODULATION FOR SIGNAL IDENTIFICATION
Philip B. Kaplan Mar. 1972 21 p refs
(DA Proj. 1M2-62301-D-117; HDL Proj. 58300)
(AD-747629; HDL-TR-1584) Avail: NTIS CSCL 09/4

The use of pulse position modulation (PPM) to code N signals has been investigated. The following three coding schemes were considered: (1) identical pulse periods with synchronization, (2) distinct pulse periods without synchronization, and (3) position modulation of alternate pulses. The theoretical performance of these methods was considered with respect to the probability of overlapping signals, the average frequency of such overlaps, and the generation of false signals. This investigation was concerned primarily with performance limitations due to signal design rather than receiver characteristics; thus, only the properties of the signal in an infinite signal-to-noise ratio environment were considered. The false signal was found to be nonexistent in coding method (1); and for each of the other two schemes, false signals were found to occur less frequently than pulse overlap. For any given set of parameters, the performance of each coding scheme as measured by the frequency of overlaps was found to be the same. Author (GRA)

N73-13181# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PERFORMANCE OF SPREAD SPECTRUM MODULATION IN A MULTIPATH ENVIRONMENT
Joseph L. Katz 21 Jul. 1972 60 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-747486; ESD-TR-72-192; TN-1972-28) Avail: NTIS CSCL 09/4

The study determines analytically the degradation experienced by two forms of spread spectrum modulation techniques, frequency hopped-frequency shift keying and pseudo noise-phase shift keying, due to multipath occurring in airborne communications channels. Results are obtained for the cases in which coded and uncoded data are used. Author (GRA)

N73-13182# Naval Research Lab., Washington, D.C.
BEHAVIOR OF ALPHA-BETA TRACKER FOR MANEUVERING TARGETS UNDER NOISE, FALSE TARGET, AND FADE CONDITIONS Interim Report
Ben H. Cantrell 17 Aug. 1972 53 p refs
(AD-748993; NRL-7434) Avail: NTIS CSCL 17/9

The behavior of the alpha-beta tracker or filter which is found in track-while-scan radars was investigated under various situations. First the target's motion was translated into signals which excite the filter. It was found that these signals could be characterized in terms of target performance capabilities such as velocity, acceleration, and structural loading. Neglecting false alarms and fades, the probability of breaking track was found to depend on the scan time, the measurement noise, the target trajectory, and the parameters alpha and beta. The tracking errors could be categorized into variances and mean errors which were investigated more fully. Using a postulated strategy, the effects of false alarms and fades were found on the variances and mean errors. Author (GRA)

N73-13183# Philco-Ford Corp., Willow Grove, Pa. Communications and Technical Services Div.
CIRCUIT QUALITY MONITOR Semiannual Report, 24 Nov. 1971 - 28 May 1972
William Foerster and C. S. Klayman Sep. 1972 37 p
(Contract DAAB07-71-C-0271; DA Proj. 1H6-63707-D-246)
(AD-749268; ECOM-0271-2; SAR-2) Avail: NTIS CSCL 17/2

The objective of the program is to establish the feasibility of automatically classifying high usage links as to their relative suitability. Author (GRA)

N73-13184# Naval Submarine Medical Research Lab., Groton, Conn.
THE INTELLIGIBILITY OF PROCESSED HELIUM SPEECH AT DIVING DEPTHS GREATER THAN 1000 FEET Progress Report
Thomas Murry 17 Jan. 1972 12 p refs
(AD-749320; NSMRL-697; PR-5) Avail: NTIS CSCL 17/2

The purpose of this study was to evaluate the intelligibility for a helium speech unscrambler undergoing development by the Admiralty Research Laboratory, Teddington, England. Tapes of divers reading sentence lists at three depths in a helium-rich environment were played to listening panels, consisting of fifteen members each. Fifty words within each sentence list were chosen for evaluation. The overall mean intelligibility scores for two divers at 1250 and 1500 feet and one diver at 1250 feet was 92.2 percent. The average score at the deepest depth was slightly lower than 1050 feet. For the limited conditions evaluated, the unscrambler appeared to operate effectively. Additional evaluation under various conditions using standardized intelligibility test material is necessary to determine the overall applicability and effectiveness of this device. Author (GRA)

N73-13185# Naval Submarine Medical Research Lab., Groton, Conn.
SPEECH INTELLIGIBILITY DURING EXERCISE AT NORMAL AND INCREASED ATMOSPHERIC PRESSURES Medical Research Progress Report
Thomas Murry, Edward J. Nelson, and Edward W. Swenson 9 Feb. 1972 13 p refs
(AD-749321; NSMRL-700; PR-8) Avail: NTIS CSCL 17/2

The purpose of this study was to assess the effects of work loads at increased ambient pressures on speech intelligibility. Six subjects were exposed to depths equivalent to 0, 50, 100 and 150 feet of sea water. At each depth, the subjects recorded one 25 word PB list at each of four work loads, 0, 50, 100 and 150 watts. Subjects were exercised on an ergometer and pedalling was maintained at the desired work load by monitoring a preset metronome. The recordings were played to naive listening panels to obtain speech intelligibility scores. The results indicate that at rest, speech intelligibility decreases by approximately 20 per cent from surface to 150 feet. With the addition of a work load, there is an additional drop in intelligibility; however, intelligibility does not continue to decrease as work load increases. Author (GRA)

N73-13186# Naval Submarine Medical Center, Groton, Conn.
THE INTELLIGIBILITY OF HYDROGEN-SPEECH AT 200 FEET OF SEAWATER EQUIVALENT Medical Research Progress Report
Russell L. Sergeant 1 Mar. 1972 15 p refs
(AD-749322; NSMRL-701; PR-9) Avail: NTIS CSCL 17/2

The purpose of this study was to evaluate the effect of breathing hydrogen on the intelligibility of speech. Taped recordings were made of a talker breathing normal air within 1 atmospheric pressure absolute (ATA) and also breathing hydrogen, helium and air at 7 ATA. Responses to the recordings by six panels of listeners were analyzed. As expected, the speech in air at 1 ATA was the most intelligible, and the speech in air at 7 ATA was next best. There was no appreciable difference in mean intelligibility between the helium and hydrogen gas mixtures. These results indicate that any decision in favor of using either hydrogen or helium mixtures in deep sea diving should not depend upon differences in intelligibility of unprocessed helium-versus hydrogen-speech. Author (GRA)

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N73-13187* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DATA PROCESSOR WITH CONDITIONALLY SUPPLIED CLOCK SIGNALS Patent
Robert J. Lesniewski, inventor (to NASA) Issued 7 Nov. 1972 9 p Filed 23 Dec. 1970 Supersedes N71-28420 (09 - 16, p 2565
(NASA-Case-GSC-10975-1; US-Patent-3,702,463; US-Patent-Appl-SN-100996; US-Patent-Class-340-172.5) Avail: US Patent Office CSCL 09B

A digital data processor where operations are performed in response to a pulse from a clock source with means for deriving binary signals indicative of the state of various indicators within the processor is described. One of the indicator signals is selectively fed through a first switch having a single output lead. The indicator output signal is fed to a second switch responsive to a command signal source and pulses from a clock source. In response to one component of the command signal source having a predetermined value, pulses from the clock source are invariably fed through the second switch. In response to the other state of the one component, pulses from the clock source are selectively gated through the second switch, depending upon the relative values of binary signals derived from the first named switch and a second component of the command signal source.
Official Gazette of the U.S. Patent Office

N73-13188# Royal Aircraft Establishment, Farnborough (England).
SOME TECHNICAL CONSIDERATIONS OF SATELLITE ON-BOARD COMPUTERS
J. Cazemajou Sep. 1972 18 p refs Transl. into ENGLISH from ESRO report SP-60, Mar., 1971 p 237-248
(RAE-Lib-Trans-1647) Avail: NTIS HC $3.00

Main ideas concerning the structure and operation of a computer are reviewed, and the importance of the part played by some purely technical parameters in the conception of a computer for installation onboard a satellite is outlined. These parameters (weight, power consumption, reliability) determine, in turn, the choice of technical solutions to be adopted to achieve the principal sub-systems of the computer (input, output, memory, central processor, etc.). A table comparing some existing and proposed computers, and a progress report on work being done on a small computer originally developed for the EOLE project, are included. Author

N73-13189# Joint Publications Research Service, Arlington, Va.
USSR SCIENTIFIC ABSTRACTS: CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY, NO. 117
16 Nov. 1972 94 p refs Transl. into ENGLISH from Ref.

Zh.-Kibernetika (USSR), no. 9, 1972
(JPRS-57529) Avail: NTIS HC $6.75

Abstracts on theory, design, development and application of analog and digital apparatus, elements and components of control systems are reported. Reliability and optimality, information theory, and the theory of automata are considered. Author

N73-13190# Joint Publications Research Service, Arlington, Va.
USSR SCIENTIFIC ABSTRACTS: CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY, NO. 116
15 Nov. 1972 82 p refs Transl. into ENGLISH from Ref. Zh.-Kibernetika (USSR), no. 8, 1972
(JPRS-57520) Avail: NTIS HC $6.25

Abstracts on theory, design, development, and application of analog and digital apparatus, elements and components of control systems, reliability and optimality, information theory, and the theory of automata are presented. Author

N73-13191*# Massachusetts Inst. of Tech., Cambridge. Alfred P. Sloan School of Management.
COMPUTERIZED MANAGEMENT INFORMATION SYSTEMS AND ORGANIZATIONAL STRUCTURES
Zenon S. Zannetos and Murat R. Sertel Sep. 1970 27 p refs
(Grant NGL-22-009-309)
(Rept-486-70) Avail: NTIS HC $3.50 CSCL 09B

The computerized management of information systems and organizational structures is discussed. The subjects presented are: (1) critical factors favoring centralization and decentralization of organizations, (2) classification of organizations by relative structure, (3) attempts to measure change in organization structure, and (4) impact of information technology developments on organizational structure changes. P.N.F.

N73-13192*# Massachusetts Inst. of Tech., Cambridge. Sloan School of Management.
DESIGN OF AN INTERACTIVE ACCOUNTING TUTOR M.S. Thesis
John Macko Sep. 1970 215 p refs
(Grant NGL-22-009-309)
(NASA-CR-129674) Avail: NTIS HC $12.75 CSCL 05I

A project to design an interactive program to teach accounting techniques is described. The four major goals of the project are discussed and a review of the literature on teaching machines and computer-assisted-instruction is included. The system is implemented on the CTSS time sharing system at M.I.T. and uses an ARDS graphic display. The software design of the system is described in detail. A typical session with the tutor is also described. Appendices include complete system documentation. Author

N73-13193# National Bureau of Standards, Washington, D.C. Statistical Engineering Lab.
OMNITAB 2: USER'S REFERENCE MANUAL
David Hogben Oct. 1972 264 p refs
(NBS-TN-552) Avail: SOD $2.00

OMNITAB 2 is a general purpose program, which can be learned quickly, for both simple and complex numerical, statistical and data analysis, OMNITAB executes instructions written in the form of simple English sentences. Problem solving is further enchanced by the natural structure of the system and its many features. The system has been implemented on large computers of at least seven different manufacturers. Author

N73-13194# Joint Publications Research Service, Arlington, Va.
INTRODUCTION TO DECISION-MAKING THEORY
V. A. Abchuk, L. A. Yemelyanov, F. A. Matveychuk, and V. G. Suzdal 2 Nov. 1972 345 p refs Transl. into ENGLISH of the book "Vvedeniye v Teoriyu Vyrabotki Resheniy, 1972" Moscow, Voyennoye Izd., 1972 342 p
(JPRS-57404) Avail: NTIS HC $19.25

Procedures are given for constructing and analyzing combat models on the basis of linear and dynamic programming, game theory, probability theory, theory of statistical solutions, and queueing theory. For each model calculation algorithms are presented, and the solutions of the standard extremal problems arising during the course of planning and executing combat operations on the sea are given as examples. Author

N73-13195*# Maryland Univ., College Park. Computer Science Center.
DOCUMENT RETRIEVAL EXPERIMENTS USING CLUSTER ANALYSIS
Jack Minker, Eero Peltola (Helsinki Univ.), and Gerald A. Wilson Oct. 1972 42 p refs
(Grant NGL-21-002-008; Contract NBS-CST-821-5; Grant NSF GJ-31456)
(NASA-CR-129804; TR-201) Avail: NTIS HC $4.25 CSCL 05B

The effect of using weighted index terms in a document retrieval system are described, and retrieval performance is evaluated when queries are expanded by terms occurring in clusters with the query terms. Three data collections, each indexed by several methods, are used to develop explicit results. The effect of weighting index terms in the document collection, the queries, and the formation of clusters is analyzed. Eight cases are investigated in which index terms are weighted and unweighted. The best results are obtained when weighted index terms are used in forming clusters, in queries, and in documents. Author

N73-13196*# Maryland Univ., College Park. Computer Science Center.
A TRANSLATOR AND SIMULATOR FOR THE BURROUGHS D MACHINE
John Roberts Aug. 1972 45 p refs
(Grant NGL-21-002-008)
(NASA-CR-129805; TR-196) Avail: NTIS HC $4.25 CSCL 09B

The D Machine is described as a small user microprogrammable computer designed to be a versatile building block for such diverse functions as: disk file controllers, I/O controllers, and emulators. TRANSLANG is an ALGOL-like language, which allows D Machine users to write microprograms in an English-like format as opposed to creating binary bit pattern maps. The TRANSLANG translator parses TRANSLANG programs into D Machine microinstruction bit patterns which can be executed on the D Machine simulator. In addition to simulation and translation, the two programs also offer several debugging tools, such as: a full set of diagnostic error messages, register dumps, simulated memory dumps, traces on instructions and groups of instructions, and breakpoints. Author

N73-13197*# Maryland Univ., College Park. Computer Science Center.
METHODS OF COMPUTING VOCABULARY SIZE FOR THE TWO-PARAMETER RANK DISTRIBUTION
H. P. Edmundson, G. Fostel, I. Tung, and W. Underwood Mar. 1972 43 p refs
(Grant NGL-21-002-008; Contract N00014-67-A-0239-0004; Grant NSF GU-2061; NR Proj. 049-261)
(NASA-CR-129806; TR-187) Avail: NTIS HC $4.25 CSCL 09B

A summation method is described for computing the vocabulary size for given parameter values in the 1- and 2-parameter rank distributions. Two methods of determining the asymptotes for the family of 2-parameter rank-distribution curves are also described. Tables are computed and graphs are drawn relating paris of parameter values to the vocabulary size. The partial product formula for the Riemann zeta function is investigated as an approximation to the partial sum formula for the Riemann zeta function. An error bound is established that indicates that the partial product should not be used to approximate the partial sum in calculating the vocabulary size for the 2-parameter rank distribution. Author

N73-13198*# Maryland Univ., College Park.
FGRAAL: TECHNICAL DOCUMENTATION
C. K. Mesztenyi, H. Breitenlohner, and J. C. Yeh Oct. 1972 55 p
(Grant NGL-21-002-008; Contract N00014-67-A-0239-0021)
(NASA-CR-129907; TR-200) Avail: NTIS HC $4.75 CSCL 09B

Implementation of FGRAAL, a FORTRAN-extended graph algorithmic language for the Univac 1108 is described. The report

contains the description of the implemented data structures for sets, lists and graphs. It summarizes the changes made for the RALPH compiler to accommodate the special statements of FGRAAL; gives the calling sequences generated by the changed compiler; and describes the object time subroutine package.
Author

N73-13199*# McDonnell-Douglas Co., Huntington Beach, Calif. Guidance and Flight Mechanics Dept.
PERFORMANCE ANALYSIS AND DESIGN SYNTHESIS (PADS) COMPUTER PROGRAM. VOLUME 1: FORMULATION Final Report
Nov. 1972 166 p refs
(Contract NAS9-12059)
(NASA-CR-128677; MDC-G4287) Avail: NTIS HC$10.50 CSCL 09B

The program formulation for PADS computer program is presented. It can size launch vehicles in conjunction with calculus-of-variations optimal trajectories and can also be used as a general-purpose branched trajectory optimization program. In the former use, it has the Space Shuttle Synthesis Program as well as a simplified stage weight module for optimally sizing manned recoverable launch vehicles. For trajectory optimization alone or with sizing, PADS has two trajectory modules. The first trajectory module uses the method of steepest descent; the second employs the method of quasilinearization, which requires a starting solution from the first trajectory module.
Author

N73-13200# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
FOURIER TRANSFORM SPECTROSCOPY WITH A PDP 11 COMPUTER
A. M. Kahan [1971] 7 p refs Sponsored in part by ARPA
(Contract AT(11-1)-3151)
(MSC-1743; COO-3151-2) Avail: NTIS HC $3.00

An assembler language program for a PDP 11/20 computer was written for on-line data acquisition and analysis of asymmetric interferograms obtained by far infrared Fourier transform spectroscopy.
Author

N73-13201# Conservatoire National des Arts et Metiers, Paris (France). Lab. d'Automatique.
CONCEPTUAL METHOD FOR AN INDUSTRIAL TOTAL MACHINE LANGUAGE (OR LOGIC SPECIFICATIONS) [METHODE DE CONCEPTION DU LANGAGE TOTAL D'UNE MACHINE LOGIQUE INDUSTRIELLE (OU REDACTION D'UN CAHIER DES CHARGES LOGIQUES)]
Michel Grossetete Toulouse CNRS 1972 13 p refs In FRENCH Presented at the Intern. Colloq. on Conception et Maintenance des Automatismes Logiques, Toulouse, 27-28 Sep. 1972
Avail: NTIS HC $3.00

The conception of a total machine language for an industrial automaton is discussed. The machine is first split up into submachines which can each be described and studied. The submachines are then interconnected. An inductive method, partially heuristic, is proposed to create the total language of a machine starting from the envisaged evolution (semantic applications of the total language). This leads to overlapping flow charts, with a hierarchy increasing level of detailed evolutionary phases.
ESRO

N73-13202# Laboratoire Central de Recherches Thomson-CSF, Orsay (France). Lab. de Magnetisme.
MAGNETO-OPTICAL MANGANESE BISMUTH MEMORY Final Report [MEMOIRE MAGNETO-OPTIQUE A MANGANESE BISMUTH RAPPORT DE SYNTHESE FINAL]
L. Dusson, R. Langlet, and M. Marchal Sep. 1971 73 p refs In FRENCH
(Contract DRME-70/34.300.00.440.75.01)
Avail: NTIS HC $5.75

Thin films of manganese bismuth have been manufactured in order to analyze their magnetic and magneto-optical properties, and to improve their conditions of preparation, as well as their mechanical properties. The conditions for writing and deletion of a 1 to 2 micron bit on a MnBi thin film are investigted using optical equipment.
Author (ESRO)

N73-13203# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
DESIGN AND DEVELOPMENT OF INTEGRATED MAGNETIC INTERNAL MEMORIES [ETUDE ET DEVELOPPEMENT DES MEMOIRES MAGNETIQUES INTEGREES CENTRALES]
M. Bonnel, P. Girault, R. Ponnet, and G. Valembois 14 Dec. 1970 46 p In FRENCH
(Contract DegInf-70.80.072.00.221.75.01)
Avail: NTIS HC $4.50

The improvements to the magnetic test equipment are summarized. Results obtained with a 1 million bit logic configuration are presented. Interconnection problems are reviewed, and improvements on development technology of memory planes are also presented.
ESRO

N73-13204# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et de ses Applications Spatiales.
USERS MANUAL: SUBPROGRAM ESTMI/1 [DOSSIER D'UTILISATION. SOUS-PROGRAMME ESTMI/1]
C. Hernandez Sep. 1972 16 p In FRENCH
(LAAS-AS-72-I-14) Avail: NTIS HC $3.00

A subroutine for estimating the parameters of a multidimensional linear system by matrices is described. Some limitations and details of memory and calling programs are also given.
Author (ESRO)

N73-13205# Naval Research Lab., Washington, D.C.
SIGNAL PROCESSING ELEMENT USERS' REFERENCE MANUAL Interim Report
5 Sep. 1972 39 p
(AD-748592; NRL-7488) Avail: NTIS CSCL 09/2

The NRL Signal Processing Element (SPE) is a high-performance signal processing facility for radar, sonar, and communication systems. It is intended to be compatible with the Navy All Applications Digital Computer (AADC). The SPE consists of four major subsystems: a Microprogrammed Control Unit (MCU), a Buffer Store and Storage Control Unit (SCU), a Signal Processing Arithmetic Unit (SPAU), and Input (I/O) units.
Author (GRA)

N73-13206# Illinois Univ., Urbana. Coordinated Science Lab.
ERROR-CORRECTING-CODES IN COMPUTER ARITHMETIC
Chao-Kai Liu Sep. 1972 112 p refs
(Contract DAAB07-67-C-0199; Grant NSF GK-24879)
(AD-748201; R-583; UILU-ENG-72-2244) Avail: NTIS CSCL 09/4

Arithmetic codes are useful for error-control in digital computation as well as in data transmission. These codes are especially suitable for checking or correcting errors in arithmetic processors due to carry propagation. Two known classes of arithmetic codes are the small-distance high-rate perfect single-error correcting codes and the large-distance low-rate Mandelbaum-Barrows codes. These codes are analogous to the Hamming codes and the maximum-length sequence codes in parity-check block codes respectively. Most other arithmetic codes known have been obtained by computer-search. The discovery for a systematic way of constructing arithmetic codes with intermediate-rate and intermediate-distance has been the subject of research for many years. Finding simpler decoding algorithms is another major unsolved problem in arithmetic codes. Decoding for arithmetic codes by matching the orbits or permuting the residues associated with the codes is straightforward but largely impractical. A particularly interesting question is the possibility of decoding arithmetic codes by majority-logic. In the paper, the author has constructed a class of intermediate-rate intermediate-distance binary cyclic arithmetic codes.
Author (GRA)

N73-13207# Utah Univ., Salt Lake City.
GRAPHICAL MAN/MACHINE COMMUNICATIONS Semiannual Technical Report, 1 Jun. - 31 Dec. 1971
David C. Evans Griffiss AFB, N. Y. RADC Dec. 1971 61 p refs
(Contract F30602-70-C-0300; ARPA Order 829)
(AD-748240) Avail: NTIS CSCL 09/2

The document includes a summary of research activities and facilities at the University of Utah under the contract. Information

conveys important research milestones attained during this period by each of the four major research activities: computer graphics techniques, computing systems, digital waveform processing and applications. Author (GRA)

N73-13618 Joint Publications Research Service, Arlington, Va.
MAIN ADMINISTRATION OF THE HYDROMETEOROLOGICAL SERVICE
A. N. Volosevich and Ye. M. Tsarkov *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 115-116 (For availability see N73-13602 04-20)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N73-13208* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTROSTATIC COLLECTOR FOR CHARGED PARTICLES Patent
Henry G. Kosmahl, inventor (to NASA) Issued 14 Nov. 1972 6 p Filed 12 Nov. 1971 supersedes N72-15197 (10 - 06, p 0740)
(NASA-Case-LEW-11192-1; US-Patent-3,702,951; US-Patent-Appl-SN-198285; US-Patent-Class-315-5.38; US-Patent-Class-315-3.5) Avail: US Patent Office CSCL 09E

A charged particle collector comprising a stack of apertured electrode plates which lie within an imaginary sphere is reported. The plate closest to a charged particle emitter forms a portion of the imaginary sphere and is at zero volts potential with respect to the emitter. The plate farthest away from the charged particle emitter is of conical shape with the apex pointing toward the emitter and includes a spike extending toward the emitter. A plurality of intermediate apertured electrode plates are positioned between the plate which forms a portion of the sphere and the conical plate. These intermediate plates approximate the shape of an equipotential line which can be plotted for the particular voltage applied to the plate.
Official Gazette of the U.S. Patent Office

N73-13209* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LOGICAL FUNCTION GENERATOR Patent
Wilfred E. Silvertson, Jr., inventor (to NASA) Issued 24 Oct. 1972 11 p Filed 16 Dec. 1970 Supersedes N72-15198 (10-06, p 0741)
(NASA-Case-XLA-05099; US-Patent-3,700,868; US-Patent-Appl-SN-98798; US-Patent-Class-235-152; US-Patent-Class-307-207; US-Patent-Class-307-215) Avail: US Patent Office CSCL 09E

Apparatus and technique for generating logical functions and circuits, and for defining the circuit connections required to generate these functions are described. An aid in designing and constructing hardware to generate logical circuits is provided.
Official Gazette of the U.S. Patent Office

N73-13210# Communications Research Centre, Ottawa (Ontario).
ATMOSPHERIC DRAG DISTORTION OF LONG SPINNING FLEXIBLE ANTENNAS
T. D. Harrison and F. R. Vigneron Jul. 1972 13 p refs
(CRC-1232) Avail: NTIS HC $3.00

A mathematical model of the distortion due to atmospheric drag on spinning flexible antennas is presented. Using parameters compatible with those of a satellite at one time proposed for the ISIS series, this model is solved for the different modes of deflection. It is concluded that the minimum perigee height should be not less than 500 km and the minimum spin rate be not less than 0.1 rpm. Author

N73-13211# Australian Post Office Research Labs., Melbourne.
PUSH BUTTON POWER SUPPLY FOR SWITCHBOARD LAMP PHOTOMETER
R. Wylie Apr. 1972 21 p refs
(Rept-6688) Avail: NTIS HC $3.25

The design of a push button power supply for switchboard lamp photometer systems output is described. The system was designed primarily for the photometer system but can be applied to other test procedures and equipment. The power features push button selection and vernier adjustment to give any one of eight dc output voltages accurate to better than + or - 0.5%. The supply is stable with both time and temperature and has a low ac ripple content. Author

N73-13212# Nagoya Univ. (Japan). Inst. of Plasma Physics.
MULTI-CHANNEL DELAY CABLE SYSTEM FOR CRT DISPLAY OF FAST SIMULTANEOUS SIGNALS
Atsushi Ogata and Genichi Horikoshi Aug. 1972 13 p refs
(IPPJ-T-9) Avail: NTIS HC $3.00

Construction of a delay cable system is described to display several simultaneous signals in nanosecond region in a single trace on an oscilloscope. The system was developed to study the energy spectrum of an injection beam of an electron ring accelerator. A block diagram and a time sequence are included.
Author

N73-13213*# National Aeronautics and Space Administration, Washington, D.C.
IDEAS ON A MODIFICATION OF THE SYNCHRONOUS AMPLIFIER TO IMPROVE SENSITIVITY
Th. Heller Dec. 1972 18 p refs Transl. into ENGLISH of an unpublished internal report from an unidentified Munich lab.
(NASA-TT-F-14719) Avail: NTIS HC $3.00 CSCL 09A

A principle for the modification of a synchronous amplifier is presented. The conventional synchronous amplifier is described, and the equation for modified synchronous amplification is derived along with the expression for the improvement factor, i.e., the ratio of the perturbing noise amplitude for the conventional and modified synchronous amplification. F.O.S.

N73-13214*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMAGE TUBE Patent Application
C. Bruce Johnson, inventor (to NASA) Filed 16 Oct. 1972 17 p
(NASA-Case-GSC-11602-1; US-Patent-Appl-SN-298157) Avail: NTIS HC $3.00 CSCL 09E

An optical image is projected onto a planar surface of a photocathode that derives an electron beam replica of the image. A target electrode displaced relative to the photocathode so that it does not obstruct the optical image includes a planar surface for receiving and deriving an accurate replica of the electron beam image. The two planar surfaces are parallel. The electron beam image is focused on the target electrode by providing throughout a region that extends between the planar surfaces of the photocathode and receiving electrode, constant, homogeneous d.c. electric and magnetic fields that are canted relative to each other. The electric field extends in a direction perpendicular to the planar surfaces while the magnetic field extends along a straight line that intersects the photocathode and target electrode at an acute angle. NASA

N73-13215*# Hughes Aircraft Co., Los Angeles, Calif. Technology Div.
DESIGN STUDY FOR A LIQUID METAL SLIP RING SOLAR ARRAY ORIENTATION MECHANISM Final Report
R. B. Clark 30 Mar. 1972 144 p refs
(Contract NAS3-13731)
(NASA-CR-120954) Avail: NTIS HC $9.25 CSCL 09E

The design of a single axis orientation mechanism for solar arrays on high power synchronous satellites is studied primarily with respect to providing 116 liquid metal slip rings for reduced friction and improved electrical characteristics. Designs and tradeoff studies for the slip rings and other components are presented. An assembly containing 33 slip rings of three design approaches was designed, fabricated, and vacuum tested to 30 amperes and 30,000 volts. Containment of the liquid metal gallium in large diameter slip rings was difficult. A design approach is presented which is expected to provide improved retention of the liquid metal. Author

N73-13216# Sandia Labs., Albuquerque, N.Mex. Electrical Standard Div.
TERMINAL INVARIANT PARAMETER DETERMINATIONS FROM COMPLEX SIGNAL RATIO MEASUREMENTS
R. D. Moyer May 1972 29 p refs Sponsored by AEC
(SC-DR-720315) Avail: NTIS

Advantages in calibrating power sensors and attenuators in terms of efficiencies rather than scattering parameters are studied. Existing efficiency measuring procedures usually require tuned measuring networks to realize necessary conditions. Procedures are presented which utilize complex signal ratio data (obtained, for example, from a network analyzer) taken from untuned microwave networks. Such procedures offer advantages in speed and convenience. Author

N73-13217# Atomic Energy of Canada Ltd., Chalk River (Ontario). Nuclear Labs.
STABLE CRYSTAL OSCILLATOR EMPLOYING DIGITAL INTEGRATED CIRCUITRY
D. A. S. Walker Mar. 1972 10 p refs
(AECL-4160) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $0.20

An inexpensive temperature controlled piezoelectric crystal is interfaced with RTL integrated circuitry to provide pulses at rates of from 1 to 1 million per second, in decade steps. This facility exhibits a long term stability of approximately 2 parts in 10 to the 7th power per month. Author (NSA)

N73-13218# Radio Corp. of America, Somerville, N.J. Solid State Div.
BROADBAND COMBINABLE MODULE FOR UHF AMPLIFICATION Final Report, 1 May 1971 - 1 Jun. 1972
J. F. Locke Aug. 1972 64 p refs
(Contract DAAB07-71-C-0190; DA Proj. 1H6-62705-A-056)
(AD-747404; ECOM-0190-F) Avail: NTIS CSCL 09/5

Using broadband stripline techniques, a 2N6266 driver amplifier was designed and constructed. The amplifier produced 10 plus or minus 0.9-dB power gain with 43- to 55-percent collector efficiency and a maximum input VSWR of 3.4:1 at 28 volts V(CC) and 1 watt of input power from 620 to 960 megahertz. Using similar techniques, a 2N6267 power amplifier was designed and constructed. The amplifier produced 8.0 plus or minus 0.5-dB power gain with 42- to 55-percent collector efficiency and a maximum input VSWR of 2.5:1 at 28 volts V(CC) and 2.5 watts of input power from 620 to 960 megahertz. Author (GRA)

N73-13219# Harry Diamond Labs., Washington, D.C.
MARDS ANTENNA DESIGN FOR SEISMIC DETECTION SYSTEMS
Frank Reggia Aug. 1972 52 p
(AD-748825; HDL-TM-72-22) Avail: NTIS CSCL 09/5

A theoretical and experimental program has been conducted to determine an optimal antenna design for use with the MARDS (Medium Artillery Delivered Sensors) seismic detection system. Several models of MARDS antennas (vertically polarized) were evaluated over a frequency range of 100 to 200 MHz in the laboratory, in an anechoic chamber, and at an outdoor antenna range. Also, several test dipole and monopole antennas were designed and evaluated within this frequency range for optimum performance with the TDV (terminal delivered vehicle) of the system. Author (GRA)

N73-13220# National Bureau of Standards, Washington, D.C. Electronic Technology Div.
TESTING AND FABRICATION OF WIRE-BOND ELECTRICAL CONNECTIONS: A COMPREHENSIVE SURVEY Final Report
Harry A. Schafft Sep. 1972 143 p refs
(AD-748788; NBS-TN-726) Avail: NTIS; SOD HC $1.25 as C13.46:736 CSCL 09/1

The fabrication and testing of wire-bond electrical connections used in integrated circuits, hybrid circuits, and low-power discrete semiconductor devices are surveyed comprehensively. The survey is generally restricted to wire-bond electrical connections where the wire diameter is less than 2 mils and where the wire is bonded either by thermocompressive or ultrasonic means. Under the general heading of fabrication, the essential features of the thermocompression and ultrasonic bonding processes, the fabrication procedures, and the characteristics of the constituent materials of the wire bond pertinent to high reliability are surveyed. Author (GRA)

N73-13221# Harry Diamond Labs., Washington, D.C.
TERMINAL RESPONSE OF BRAIDED-SHIELD CABLES TO EXTERNAL MONOCHROMATIC ELECTROMAGNETIC FIELDS
Sidney Frankel Aug. 1972 47 p refs
(HDL Proj. E05E6)
(AD-748387; HDL-TR-1602) Avail: NTIS CSCL 09/1

The study had two purposes to assess the relative importance of magnetic and electric coupling parameters of braided shields in the determination of terminal response of braided-shield cables to external electromagnetic fields and to compare a postulated coupling model with those on which various experimental determinations of shielding effectiveness have been based. Author (GRA)

N73-13222# Army Electronics Command, Fort Monmouth, N.J.
AN ANALYSIS AND APPLICATION OF SINGLE-GUN PHOSPHOR PENETRATION COLOR CATHODE-RAY TUBES
Philip F. Krzyzkonski Aug. 1972 26 p refs
(DA Proj. 1S6-62705-A-055)
(AD-748385; ECOM-4009) Avail: NTIS CSCL 09/1

Single-gun color cathode-ray tubes, manufactured by Sylvania and General Electric Company (GE), were investigated for possible military applications. Synthetic signals were used to simulate operational displays. Laboratory equipment, consisting of a dual Flying-Spot Scanner (FSS) and Closed Circuit TV (CCTV) camera system, provided static and Moving-Target-Information (MTI) video signals; TV raster format was used for two and four-color displays. Anode switching and deflection-correction circuitry were built to show tube-circuitry requirements. In addition to demonstration of the displays to observers, polaroid color photo-recording was used to record the information. Engineering discussions, resulting from demonstrations, indicate potential applications for such tubes that will enhance overall system operation. Author (GRA)

N73-13223# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
[SPEECH ANALYSIS, SYNTHESIS, AND SIGNAL PROCESSING] Research Technical Report, 15 Jan. - 30 Aug. 1972
Alan V. Oppenheim 30 Aug. 1972 54 p refs
(Contract N00014-67-A-0204-0064; ARPA Order 1997)
(AD-748212) Avail: NTIS CSCL 09/4

During the first half of the present contract year, the program initiated or continued the following studies: Speech analysis by linear prediction, reconstruction of multidimensional signals from projections, applications of digital frequency warping, and development of a digital speech synthesizer. A review was also made of design and synthesis of digital filters within the constraints of finite register length. These projects are summarized and reprints of available publications are appended. Author (GRA)

N73-13224# Watkins-Johnson Co., Palo Alto, Calif.
ELECTRON BEAM SEMICONDUCTOR AMPLIFIER (L-BAND) Triannual Report No. 4, 1 Jul. - 31 Oct. 1971
James A. Long Jul. 1972 37 p
(Contract DAAB07-70-C-0223)
(AD-748898; W-J-22-4081-4; ECOM-0223-4) Avail: NTIS CSCL 09/5

The goal of the program is to design, develop, fabricate and test exploratory development models of an L-band, RF pulse amplifier capable of 2 kilowatts peak output RF power at 1300 MHz plus or minus 10%, with a 25 dB power gain at 50% efficiency. Author (GRA)

N73-13225# Sedco Systems, Inc., Farmingdale, N.Y.
SLOT LINE DIGITAL FERRITE PHASE SHIFTER Final Report, 30 Oct. 1970 - 30 Jun. 1972
Irwin Bardash and Allan G. Gayer Aug. 1972 67 p refs
(Contract DAAB07-71-C-0056; DA Proj. 1H6-2705-A-057)
(AD-748431; ECOM-0056-F) Avail: NTIS CSCL 09/5

The report describes analytical and experimental techniques used in the development, design and construction of nonreciprocal slotline latching ferrite phase shifters for use in phased array antenna systems. A phase shifter configuration consisting of two

0.020 inch dielectric substrates surrounded by a single ferrite toroid with a wall thickness of 0.040 inches was shown to yield frequency independent differential phase shift of about 90 degrees/inch from 5.0 to 10.0 GHz with an accompanying insertion loss between 2 and 3 db. A 0.040 inch slot was etched longitudinally on one of the dielectric substrates to form the slotline circuit. The length of the ferrite toroid and substrates was 4.5 inches. Author

N73-13226# Army Electronics Command, Fort Monmouth, N.J.
A SUPERCONDUCTIVE TUNABLE FILTER WITH BROAD TUNING RANGE
J. R. Vig and Emanual Gikow Aug. 1972 21 p refs
(DA Proj. 1S6-62703-A-057)
(AD-749237; ECOM-4010) Avail: NTIS CSCL 09/5

The near zero resistance of superconductors makes it possible to construct resonant circuits with very low losses. Such high Q tunable circuits can provide low noise, narrow band, wide dynamic range tuners for communications equipments. The tuner discussed is a superconductive, tunable, parallel L-C resonant circuit. The inductance and capacitance are varied simultaneously. A tuning range of 17:1 in frequency has been achieved within a single band - from 1.3 MHz to 23 MHz. Bandwidth can be controlled by coupling control. Q's in excess of 105 were measured. Author (GRA)

N73-13227# Army Electronics Command, Fort Monmouth, N.J.
FABRICATION AND EVALUATION OF RF SPUTTERED BARIUM TITANATE THIN FILMS
I. H. Pratt, S. Firestone, and H. C. Frankel Aug. 1972 41 p refs
(DA Proj. 1S6-62703-A-440)
(AD-749236; ECOM-4006) Avail: NTIS CSCL 09/5

Structural, chemical, dielectric, and ferroelectric (limited) characteristics of RF sputtered barium titanate ($BaTiO_3$) are described. Primary interest was to determine film capability for providing high capacitance devices for hybrid and thin film integrated circuits. The extent of ferroelectric film behavior was also of concern for charge storage use in the development of thin film image plates for miniature solid state facsimile cameras. Metal-dielectric-metal capacitor structures incorporating amorphous or polycrystalline $BaTiO_3$ films were fabricated and evaluated. Author (GRA)

N73-13228# Stanford Research Inst., Menlo Park, Calif.
LOW ENERGY MONOENERGETIC FLOOD SOURCE Final Report
C. A. Spindt Sep. 1972 29 p refs
(Contract DAAK02-72-C-0144; SRI Proj. 1538)
(AD-749556) Avail: NTIS CSCL 09/1

The objective of the program was to fabricate 20 experimental, individual, miniature, thin-film field emission cathodes of the type developed by Stanford Research Institute. These cathodes are to be evaluated by the Night Vision Laboratory in terms of the energy distribution of the emitted electrons. Author (GRA)

N73-13229# Naval Ordnance Lab., White Oak, Md.
AN OPERATIONAL AMPLIFIER PRIMER
Arthur D. Delagrange 14 Aug. 1972 62 p refs
(ZF35419001; UF17311206)
(AD-749013; NOLTR-72-166) Avail: NTIS CSCL 09/5

The report discusses the use of integrated circuit operational amplifiers, the most common linear (analog) integrated circuit. Both the idealistic theory and the practical limitations of actual devices are discussed. Basic circuits of most common types are given. Some examples of circuits in actual use are included for illustration. Author (GRA)

N73-13230# Radio Corp. of America, Lancaster, Pa. Electro-Optics Products.
PHOTOMULTIPLIER TUBE FOR EFFICIENT INFRARED DETECTION Quarterly Progress Report, 22 Jun. - 21 Sep. 1971
Dennis E. Persyk and Fred R. Hughes Aug. 1972 36 p refs
(Contract DAAB07-70-C-0273)
(AD-749269; ECOM-0273-5; QPR-5) Avail: NTIS CSCL 17/5

The goal of this contract is to develop a 3/4 inch diameter photomultiplier for detection of 1.06 micrometers laser light. This quarterly report discusses photocathodes made in three different geometries. Activation techniques are described and the differences among the three geometries are noted with respect to their effects on quantum efficiency. Stable quantum efficiencies in photomultipliers have increased by a factor of four (to 0.24% at 1.06 micrometers) over those reported in the last quarterly report. The growth system for GaInAs is described and a discussion of materials parameters is given. Detailed material composition studies were made during this period and the methods and results are presented. In addition to the materials characterization a critique of spectral response measurements is included to complete the description of photocathode characterization methods. Author (GRA)

N73-13231# GTE Labs., Inc., Waltham, Mass.
HIGH CAPACITANCE THIN FILM STRUCTURES Final Report, 15 Apr. 1971 - 14 Apr. 1972
Moe S. Wasserman and Alfred E. Feuersanger Sep. 1972 46 p refs
(Contract DAAB07-71-C-0181; DA Proj. 1S6-62705-A-440)
(AD-749266; ECOM-0181-F) Avail: NTIS CSCL 09/1

Silicon integrated square-wave oscillator circuits with an output frequency of 2 to 3.5 kHz were fabricated with thin-film Al-Al_2O_3-NiO-Al capacitors on their surface as the frequency-determining components. The capacitor values were in the range of 0.4 to 1.8 nF, corresponding to a specific capacitance between 3 and 10 microfarads/sq in. Minor modifications of the fabrication process are proposed for improving the uniformity of the capacitance values and maintaining the design goal of 10 microfarads/sq in. Author (GRA)

N73-13232# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
TACTICAL MINIATURE CRYSTAL OSCILLATOR Semiannual Report, 1 Jul. 1971 - 31 May 1972
Raymond K. Hart and Walter H. Hicklin Aug. 1972 50 p refs
(Contract DAAB07-71-C-0301)
(AD-749271; GIT-A-1344; ECOM-0301-1) Avail: NTIS CSCL 09/5

The purpose of the work is to design and construct exploratory development models of a fast warmup 5 MHz tactical miniature crystal oscillator (TMXO). The total package is to be contained within a volume not to exceed 5 cubic inches, operate in an ambient temperature range of -40 to 75C with a maximum permissible frequency deviation of plus or minus 1 X 10 to the minus 8th power. Available power to heat the temperature sensitive elements of the TMXO from ambient to 85C in one minute is 10 watts; operating power after warmup will be limited to 250 milliwatts. An output frequency deviation, after a 30 day stabilization period, of less than plus or minus 2 X 10 to the minus 10th power per week is required, as well as a short term stability of plus or minus 1 X 10 to the minus 11th power for periods of time ranging from 1 sec to 20 min.
Author (GRA)

N73-13233# Naval Postgraduate School, Monterey, Calif.
THE IMPEDANCE CHARACTERISTICS OF A COAXIAL TEM-LINE ANTENNA M.S. Thesis
Jerry Neal Layl Jun. 1972 40 p refs
(AD-749051) Avail: NTIS CSCL 09/5

The coaxial TEM-line antenna is a low-profile, lightweight, simply constructed antenna that can be easily mounted on a wide variety of conducting surfaces. It is a low to medium gain antenna element capable of operation in broadside or frequency scanning modes. The paper presents a method of determining the impedance characteristics of a single flush mounted radiating gap. Several radiation patterns are presented to illustrate beam shape and scanning. The Brillouin or omega-beta diagram is used to relate the frequency scanning properties to periodic structure theory. GRA

N73-13234# Michigan Univ., Ann Arbor. Electron Physics Lab.
MICROWAVE SOLID-STATE DEVICE AND CIRCUIT STUDIES Quarterly Progress Report, 1 Mar. - 1 Jun. 1972
G. I. Haddad Griffiss AFB, N. Y. RADC Aug. 1972 69 p refs

(Contract F30602-71-C-0099; AF Proj. 5573)
(AD-749500; RADC-TR-72-188; Rept-037250-7; QPR-7) Avail: NTIS CSCL 09/1

Objectives are to investigate theoretically and experimentally new solid-state phenomena and techniques having application to microwave generation, amplification and control. Current tasks under the program are the following: High-power Gunn-effect devices; Gunn-effect amplifiers; Modulation properties of Gunn-effect devices; Avalanche-diode amplifiers; High-efficiency avalanche diodes; Nonlinear operating characteristics of IMPATT diodes; Solid-state device fabrication; Instabilities in germanium. Author (GRA)

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N73-13235* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
ELECTRONIC VIDEO EDITOR Patent
Darrow L. Webb, inventor (to NASA) Issued 14 Nov. 1972 6 p Filed 4 Aug. 1970 Supersedes N70-41966 (08 - 24, p 4487)
(NASA-Case-KSC-10003; US-Patent-3,702,898; US-Patent-Appl-SN-60883; US-Patent-Class-178-6; US-Patent-Class-178-DIG.6; US-Patent-Class-307-242; US-Patent-Class-307-259; US-Patent-Class-328-104; US-Patent-Class-328-154) Avail: US Patent Office CSCL 09E

An electronic video editor is described for switching any one of a plurality of video input signals to a common output channel. The switching operation is manually initiated and electronically controlled so that the switching from one video input signal to another takes place during the blanking portion of the signal in order that frames of the picture are not lost. Official Gazette of the U.S. Patent Office

N73-13236# Australian Post Office Research Labs., Melbourne.
DESIGN OF A VARIABLE ACTIVE ATTENUATION EQUALIZER AND THE ASSOCIATED IMPEDANCE SIMULATING NETWORK FOR UNLOADED CABLES
I. Macgregor Oct. 1971 31 p refs
(REPT-6650) Avail: NTIS HC $3.75

The techniques used to obtain initial approximate designs and final designs in which a least squares error criterion is employed are produced with the aid of a digital computer. Several examples of both attenuation equalizers and impedance simulating networks are given. Author

N73-13237*# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
A COMPUTER AIDED BROAD BAND IMPEDANCE MATCHING TECHNIQUE USING A COMPARISON REFLECTOMETER Ph.D. Thesis
Robert Stephen Gordy Jul. 1972 249 p refs
(Grants NGR-11-002-081; NGT-11-002-064)
Avail: NTIS HC $4.50 CSCL 09C

An improved broadband impedance matching technique was developed. The technique is capable of resolving points in the waveguide which generate reflected energy. A version of the comparison reflectometer was developed and fabricated to determine the mean amplitude of the reflection coefficient excited at points in the guide as a function of distance, and the complex reflection coefficient of a specific discontinuity in the guide as a function of frequency. An impedance matching computer program was developed which is capable of impedance matching the characteristics of each disturbance independent of other reflections in the guide. The characteristics of four standard matching elements were compiled, and their associated curves of reflection coefficient and shunt susceptance as a function of frequency are presented. It is concluded that an economical, fast, and reliable impedance matching technique has been established which can provide broadband impedance matches. Author

N73-13238*# Ampex Corp., Redwood City, Calif.
DEVELOPMENT OF A MONOLITHIC FERRITE MEMORY ARRAY
C. H. Heckler, Jr. and N. C. Bhiwandker Washington NASA Dec. 1972 66 p
(Contract NAS1-8170)
(NASA-CR-2152) Avail: NTIS HC $3.00 CSCL 09C

The results of the development and testing of ferrite monolithic memory arrays are presented. This development required the synthesis of ferrite materials having special magnetic and physical characteristics and the development of special processes; (1) for making flexible sheets (laminae) of the ferrite composition, (2) for embedding conductors in ferrite, and (3) bonding ferrite laminae together to form a monolithic structure. Major problems encountered in each of these areas and their solutions are discussed. Twenty-two full-size arrays were fabricated and fired during the development of these processes. The majority of these arrays were tested for their memory characteristics as well as for their physical characteristics and the results are presented. The arrays produced during this program meet the essential goals and demonstrate the feasibility of fabricating monolithic ferrite memory arrays by the processes developed. Author

N73-13239# Joint Publications Research Service, Arlington, Va.
MICROELECTRONICS
F. V. Lukin, ed. 25 Oct. 1972 17 p Transl. into ENGLISH from the book "Mikroelektronika" Moscow, Sov. Radio Publishing House, 1972
(JPRS-57333) Avail: NTIS HC $3.00

Problems concerning the computation, design, and manufacture of integrated circuits are discussed. The analysis is directed toward the operation of circuits intended for computers, as well as linear integrated circuits on bipolar and MDP transistors. Attention is directed toward computing the noises observed in equipment constructed on integrated circuits. Algorithms are given for machine computation of integrated circuits. Author

N73-13240# Institute of Nuclear Research, Warsaw (Poland).
ANALYSIS OF THE GAIN STABILITY AND LINEARITY OF AN ACTIVE ELECTRONIC CIRCUIT WORKING WITH LARGE SIGNALS
Ryszard Bayer 1972 180 p refs In POLISH
(INR-1371) Avail: AEC Depository Libraries

Analysis of an active electronic circuit, based on the determination of the temperature and dynamic changes of a particular circuit parameter and the determination of the reduction coefficient value of this parameter, has been proposed. The method enables to determine the overall temperature stability and linearity in the gain of a circuit working with large signals. Verification of the proposed method is made with the help of the analysis of two commonly used circuits, such as emitter follower and source follower. The influence of the input signal dynamics on the signal amplitude transmission linearity of these circuits is examined and the temperature stability of the circuit parameters is developed. Author (NSA)

N73-13241# Bendix Corp., Kansas City, Mo.
DIAGNOSIS OF MALFUNCTIONS IN COMPLEX ELECTRONIC ASSEMBLIES Final Report
J. A. Losure Sep. 1971 63 p
(Contract AT(29-1)-613)
(BDX-613-337-Rev) Avail: NTIS

A study to determine troubleshooting skills necessary to isolate the causes of malfunctions in complex electronic assemblies, to devise effective means of transmitting engineering-support information to production troubleshooting facilities, and to develop rapid and effective equipment for in-process testing of subassemblies at low levels of assembly has resulted in increased production, reduced rework, lower scrap rates, and cost savings. Troubleshooting manuals were developed to enable troubleshooting technicians to function more effectively. Special in-process testers and an on-line manufacturing troubleshooting facility were effective, and many of the findings of the assessment of required troubleshooter skills contributed to the attainment of the project objectives. Author

N73-13242# Bendix Corp., Kansas City, Mo.
THIN INSULATOR SHAPES
J. C. Daly Jan. 1972 19 p refs
(Contract AT(29-1)-613)
(BDX-613-502-Rev) Avail: NTIS

Electrical insulator material of less than 0.020-inch thickness with a potential of withstanding 80 kilovolts was requested for an experimental program. Materials such as fluorocarbons, polysulfones, and polyimides may have this capability, if the resin is sufficiently clean and the correct assembly environment is provided. Various processes were investigated for fabricating one full and one half-size insulator. Several fabricating techniques were tried to produce a final part: tape wrapping and sintering, emulsion coating with final sintering, solvent deposition of soluble thermoplastic materials, and fluidized bed coating and final sizing of a hot-melt, coated mandrel. Author

N73-13243# Sandia Labs., Albuquerque, N.Mex. Electrical Standards Div.
RECENT REFINEMENTS AND DEVELOPMENTS IN KERR SYSTEM ELECTRICAL MEASUREMENT TECHNIQUES
Esther Christmas Cassidy (NBS, Washington, D. C.), William E. Anderson (NBS, Washington, D. C.), and Stanley R. Booker 1972 21 p refs Sponsored by AEC
(SC-DC-721375) Avail: NTIS

High speed photographic recording of two dimensional electro-optical fringe patterns is used to study the pulsed electric field between Kerr cell electrodes for evaluation and correction of path-dependent errors in Kerr cell voltage measurements, and for voltage measurements under high noise or discharge conditions. Author

N73-13244# European Organization for Nuclear Research, Geneva (Switzerland).
DESIGN AND CONSTRUCTION OF A SPARK GAP ASSEMBLY AND ASSOCIATED CIRCUITS
L. Hubbeling 4 Apr. 1972 15 p refs
(CERN-72-6) Avail: AEC Depository Libraries

The electronic circuit and performance of a spark gap assembly are described. This assembly gave 150 nsec pulses up to 10 kV into a 6 ohm load at a repetition time of 12 msec and was used for driving a number of large-area spark chambers. Mechanical details are given of a modified version of the spark gap that was actually used. A fast trigger circuit delivering 10 to 15 kV pulses with a delay of about 60 nsec is also described. For protection of the spark chambers and other equipment, a monitoring device switches off the high-voltage power supplies should one of the gaps break down. Author (NSA)

N73-13245# Sandia Labs., Albuquerque, N.Mex.
SEMICONDUCTOR DEVICE DEGRADATION BY HIGH AMPLITUDE CURRENT PULSES
W. D. Brown Jul. 1972 34 p refs Sponsored by AEC
(SC-RR-720515) Avail: NTIS

The results of a lengthy and comprehensive investigation of semiconductor device degradation from gamma-induced nanosecond current pulses are given. Topics discussed include (1) previously published literature on pulse degradation and second breakdown, (2) experimental results obtained in several studies, (3) pulse damage recovery using several annealing techniques, (4) a model of the pulse damage, (5) possible methods of hardening against pulse degradation, and (6) a preventive measure that can be taken to eliminate pulse damage. Author (NSA)

N73-13246# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et de ses Applications Spatiales.
EXPERIMENTAL CHARACTERIZATION OF ABRUPT JUNCTIONS IN AVALANCHE REGIME [CARACTERISATION EXPERIMENTALE DES JONCTIONS ABRUPTES EN REGIME D'AVALANCHE]
J. Urgell and R. Leguerre 1972 15 p In FRENCH Presented at the DGRST Colloq. on Mater. Characterization and Semiconductor Technol., Grenoble, France, 27-29 Sep. 1972
(LAAS-Publ-939) Avail: NTIS HC $3.00

Characterization methods for avalanche bursting of inversed polarized barriers are presented. Electrical values measured on such structures are burst voltage and primary carrier current. Measurements, in conditions determined from these values, permit experimental determination of the avalanche area in the void zone and of the ionization velocity. The method is based on the properties of steep barriers manufactured from a doped homogeneous material such as P plus N, or N plus P, or Schottky barriers. Experimental results are presented. Author (ESRO)

N73-13247# Grenoble Univ. (France). Lab. de Mathematiques Appliquees.
STRUCTURES FOR THE GLOBAL STUDY OF MULTIPLE FAULTS IN A COMBINATIONAL LOGIC NETWORK [STRUCTURES SUR L'ENSEMBLE DES PANNES MULTIPLES D'UN RESEAU COMBINATOIRE]
A. Verdillon Toulouse CNRS 1972 6 p refs In FRENCH Presented at the Intern. Colloq. on Conception et Maintenance des Automatismes Logiques, Toulouse, 27-28, Sep. 1972
Avail: NTIS HC $3.00

The treatment of multiple faults in a logic network is described. Because of their great number it is necessary to structure and group multiple faults. An indistinguishability (for the localization) and an order relation (for the detection) are defined, and these levels are considered: a local study of the faults of a given gate; studies of the structure of the network (the gates are not distinguishable) and a global study of multiple faults in a network. ESRO

N73-13248# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et de ses Applications Spatiales.
FAULT DETECTION IN A MONOTONIC NETWORK. EASILY TESTABLE NETWORK SYNTHESIS [DETECTION DES PANNES DANS UN RESEAU MONOTONE. SYNTHESE DE CIRCUITS FACILEMENT TESTABLES]
J. P. Richard, P. Azema, and J. C. Ippolito 1972 11 p refs In FRENCH Presented at the Intern. Colloq. on Conception et Maintenance des Automatismes Logiques, Toulouse, 27-28 Sep. 1972
Avail: NTIS HC $3.00

A method is presented for generating tests for multiple faults in parity circuits. It is shown that the set of characteristics points of the first and second kind permit testing of the set of simple faults (stuck-at-0 or 1) of a non-redundant realization of a monotone function. A generalization of this result is proposed by proving that the set of characteristic points leads to the detection of each multiple fault of a parity circuit, even when redundant. The results are used to design easily testable circuits. ESRO

N73-13249# Academy of Sciences (USSR), Moscow. Inst. d'Automatique et de Telemecanique.
SYNTHESIS OF EASILY CONTROLLABLE LOGIC NETWORK [SYNTHESE DES SYSTEMES LOGIQUES FACILEMENT CONTROLABLES]
V. N. Ostianou Toulouse CNRS 1972 5 p refs In FRENCH Presented at the Intern. Colloq. on Conception et Maintenance des Automatismes Logiques, Toulouse, 27-28 Sep. 1972
Avail: NTIS HC $3.00

The method of increasing logic circuit reliability is improved by using error correcting codes to reduce introduced redundancy. Asymptotic estimations are developed for the complexity of the obtained networks, and a method is presented which uses the introduced redundancy for the signalization of faults in the network. ESRO

N73-13250# Bulgarian Academy of Science, Sofia. Inst. of Engineering Cybernetics.
A REDUNDANT CELL FOR RELIABLE ASYNCHRONOUS SEQUENCES
Nadezhda Doncheva Toulouse CNRS 1972 8 p refs Presented at the Intern. Colloq. on Conception et Maintenance des Automatismes Logiques, Toulouse, 27-28 Sep. 1972
Avail: NTIS HC $3.00

A possibility of increasing the reliability of asynchronous automata realized by modern microelectronic technology using redundant cells is considered. A generalized model of a redundant cell is presented, which serves as a basis for different variants of redundant cells with the same error correction capability, so that an optimal technological variant can be chosen. A variant

of a redundant cell using quadded logic is described and a structure with a distributed restoring organ is presented based on a simplified redundant cell. A redundant cell containing majority elements and a quadded redundant cell are compared from a technological point of view. The comparison is shown to be in favor of the latter. The problem of obtaining reliable outputs from the structure is discussed. Several variants of output cells are described. Author (ESRO)

N73-13251# Academy of Sciences of the Latvian SSR, Riga. Inst. of Electronics and Computing Technique.
MODELS OF ASYNCHRONOUS SEQUENTIAL CIRCUITS
E. A. Yakubaitis, A. J. Gobzemis, and A. F. Petrenko Toulouse CNRS 1972 11 p refs Presented at the Intern. Colloq. on Conception et Maintenance des Automatismes Logiques, Toulouse, 27-28 Sep. 1972
Avail: NTIS HC $3.00

The possibilities of application of different non-standard models of asynchronous sequential circuits with special delays at inputs and feedbacks are considered. From the sets of models those types are singled out which provide maximum possibilities of eliminating critical races and hazards. The highest estimates for the word length of internal states and of the number of logical operations in structural equations are given.
Author (ESRO)

N73-13252# Army Foreign Science and Technology Center, Charlottesville, Va.
WOUND STRUCTURES IN ELECTRICAL MACHINES AND EQUIPMENT
R. E. Brivmanis and A. K. Gaganov 23 Aug. 1972 76 p refs Tranls. into ENGLISH of the mono. "Namotochnye Konstruktsii v Elektricheskikh Mashinakhi Apparatakh" Energiya publishing house
(AD-748737; FSTC-HT-23-1198-72) Avail: NTIS CSCL 09/3

The possibilities of widespread use of unidirectional glass plastics for the wound structures of electrical machines and equipment are pointed out. The results of investigations of the structural and technological properties of unidirectional winding materials, of the winding process, and of the questions of the strength of the wound parts, are used, and experience in the manufacture and operation of wound structures of the banking ring type are generalized. Author (GRA)

N73-13253# Rome Air Development Center, Griffiss AFB, N.Y.
ANALYSIS OF STATE OF THE ART OF GROUND ELECTRONIC EQUIPMENT SHELTERS Final Report
John J. Guba Sep. 1972 40 p refs
(AF Proj. 57020)
(AD-748808; RADC-TR-72-210) Avail: NTIS CSCL 09/3

The report discusses the state of the art in the design of ground electronic equipment shelters, in mobile systems for military ground-support application. Design factors are listed and the more important of these are discussed in detail. Two systems typifying different design concepts are described in order to illustrate specific design problems and to compare the present approaches that are being used to meet military requirements.
Author (GRA)

N73-13254# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOME ACHIEVEMENT OF ELECTRONICS IN ANTIAIRCRAFT DEFENSE
A. Pozeg 23 Jun. 1972 12 p refs Transl. into ENGLISH from Vazduhoplovni Glasnik (Yugoslavia), v. 1, no. 7, 1960 p 224-229
(AF Proj. J206)
(AD-748709; FTD-HC-23-0629-72) Avail: NTIS CSCL 15/3

Contents: Radio equipment for the command and guidance network; Radionavigation equipment; Radar equipment; General possibilities for jamming electronic devices used in antiaircraft defense. GRA

N73-13255# General Electric Co., Pittsfield, Mass. Ordnance Systems.
ELECTRICAL CHARACTERIZATION OF COMPLEX MICROCIRCUITS Final Technical Report, Mar. 1971 - Mar. 1972
David A. Citrin Jun. 1972 307 p refs
(Contract F30602-71-C-0188)
(AD-748242; RADC-TR-72-145) Avail: NTIS CSCL 09/5

Section 3000 of MIL-STD-883 was reviewed and rewritten. New or modified slash sheets to MIL-M-38510 were prepared for DTL and T2L-SSI logic circuits, 741 Operational Amplifier, 710/711/LM106 Differential Comparator, and the 723 Regulator. The results of the vendor comparison, test circuits, and proposed slash sheets are included. Test profiles were prepared for a broad range of bipolar and MOS semiconductor memories. ROM's PROM's, and static and dynamic RAM's were considered. The test profiles cover static and dynamic functional test requirements. MSI/LSI test considerations were based upon the development of a minimum set of logic tests, based upon a stuck-at-one, stuck-at-zero philosophy in order to provide a rapid and accurate functional test of complex devices. This testing criteria termed Logic Integrity Tests is described and is proposed for inclusion in MIL-STD-883. Test Vectors based upon the Logic Integrity Test for the 2 and 4 bit full adders, 4 x 2 multiplier and the 9341/54181 Arithmetic Logic Unit are included in this report.
Author (GRA)

N73-13256# Texas Univ., Austin. Electronics Research Center.
TEXAS BIANNUAL OF ELECTRONICS RESEARCH Final Report, 1 Oct. 1972 - 31 Mar. 1972
Arwin A. Douglas, O. M. Friedrich, Jr., D. G. Cainiotis, E. J. Powers, and C. V. Ramamoorthy 15 May 1972 249 p refs
(Contract F44620-71-C-0091; AF Proj. 4751)
(AD-748281; AFOSR-72-1382TR; FR-15) Avail: NTIS CSCL 09/3

The report includes recent findings, research investigations, progress reports and future plans in the areas of Solid State Electronics, Information Systems, Plasma and Quantum Electronics, Biomedical Electronics and Acoustic and Radio Sciences.
Author (GRA)

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N73-13257* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FERRY SYSTEM Patent
Thomas A. Blackstock, inventor (to NASA) Issued 17 Oct. 1972 4 p Filed 24 Aug. 1970 Supersedes N70-41958 (08 - 24, p 4490)
(NASA-Case-LAR-10574-1; US-Patent-3,698,659; US-Patent-Appl-SN-66206; US-Patent-Class-244-1SS) Avail: US Patent Office CSCL 01E

A method for providing a ferrying capability for an entry vehicle is presented. The device consists of a pair of wings which bolt on to the entry vehicle. One propulsion system is attached to each wing. Fuel tanks are formed within the wings and the body member. P.N.F.

N73-13258 Vanderbilt Univ., Nashville, Tenn.
THE TEST FACILITY'S ROLE IN THE EFFECTIVE DEVELOPMENT OF AEROSPACE SYSTEMS Ph.D. Thesis
James Guy Mitchell 1971 196 p
Avail: Univ. Microfilms Order No. 72-3225

A study of the origin of the facility test plan, which controls the use of test facilities during system's development, showed that inclusion of the test plan in the bidding procedure for aircraft development contracts tends to force the test plans toward inadequacy because of conflicting incentives in the competitive process. There is strong agreement among the experts that changes should be made in the method of preparing and evaluating the test plan; several such changes were suggested and considered. Dissert. Abstr.

N73-13259# CONSAD Research Corp., Pittsburgh, Pa.
A COMMUNITY/AIRPORT ECONOMIC DEVELOPMENT MODEL. VOLUME 1: GENERAL CONCEPT AND APPLICATION Final Report, Apr. 1971 - May 1972
Jere J. Hinkle May 1972 90 p refs
(Contract DOT-FA71WA-2565)
(FAA-EQ-72-3-Vol-1) Avail: NTIS HC $6.50

A community/airport economic development model (CAEDM) which was developed to assist in the land use planning process in the vicinity of airports in metropolitan areas is described. The model is a computerized technique which has two objectives. The first is to examine the existing or projected land use activities in the vicinity of an airport to determine their compatibility with aircraft generated noise levels and to estimate the economic and social costs of alternative remedial actions that can be taken to resolve the incompatibilities. The second objective is to determine the kind and amounts of land use activities that can be located in the vicinity of the airport that can utilize the services available (transportation and utilities) and be compatible with the noise levels anticipated there. The results of the application of this technique to Dulles International Airport are described, and the applicability to the CAEDM to fourteen airports is assessed. Author

N73-13260# CONSAD Research Corp., Pittsburgh, Pa.
A COMMUNITY/AIRPORT ECONOMIC DEVELOPMENT MODEL. VOLUME 4: PROGRAMMERS' MANUAL Final Report, Apr. 1971 - May 1972
Jere J. Hinkle May 1972 55 p refs
(Contract DOT-FA71WA-2565)
(FAA-EQ-72-3-Vol-4) Avail: NTIS HC $4.75

Sample output of the community/airport economic development model is given. Author

N73-13261# National Aviation Facilities Experimental Center, Atlantic City, N.J.
FLIGHT TEST AND EVALUATION OF HELIPORT LIGHTING FOR IFR Final Report, Mar. 1969 - Oct. 1972
Thomas H. Paprocki Dec. 1972 27 p ref
(FAA Proj. 074-390-02X)
(FAA-RD-72-133; FAA-NA-72-89) Avail: NTIS HC $3.00 CSCL 01E

Various approach lighting system patterns, developed through mockup and VFR flight testing efforts, were evaluated to determine their effectiveness in providing visual guidance for helicopter IFR approach and landing operations. Four basic lighting configurations were flown, under actual IFR weather conditions, by experienced helicopter pilots. As a result of information collected through in-flight recording of objective data and post flight completion of pilot questionnaires, one of the lighting patterns was chosen as most effective for the conditions specified. Author

N73-13262# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF A MARINE MAGNETOVARIATION STATION FOR STUDIES BY THE MAGNETOTELLURIC SOUNDINGS METHOD
Yu. M. Polonskiy 5 Dec. 1972 8 p Transl. into ENGLISH from Morsk. Geol. i Geofiz. (Leningrad), no. 2, 1971 p 152-156
(JPRS-57678) Avail: NTIS HC $3.00

Data on the development and improvement of instrumentation for investigating the structure of the earth's crust and upper mantle are presented. The development of a marine magnetovariation station for studies by the magnetotelluric soundings method is discussed. Author

N73-13263*# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PERFORMANCE OF THE BOEING LRV WHEELS IN A LUNAR SOIL SIMULANT. REPORT 2: EFFECTS OF SPEED, WHEEL LOAD, AND SOIL
K.-J. Melzer Dec. 1971 89 p refs
(NASA-Order H-79205)
(NASA-CR-129612; M-71-10) Avail: NTIS HC $6.50 CSCL 13F

Two nearly identical Boeing-GM wire-mesh Lunar Roving Vehicle (LRV) wheels were laboratory tested in a lunar soil simulant to determine the influence of wheel speed and acceleration, wheel load, presence of a fender, travel direction, and soil strength on the wheel performance. Constant-slip and three types of programmed-slip tests were conducted with a single-wheel dynamometer system. Test results indicated that performance of single LRV wheels in terms of pull coefficient, power number, and efficiency were not influenced by wheel speed and acceleration, travel direction, the presence of a fender, or wheel load. Of these variables, only load influenced sinkage, which increased with increasing load. For a given slip, the pull coefficient and power number increased with increasing soil strength. However, for a given pull coefficient or slope, slip was less in firmer soil; thus, the power number decreased and efficiency increased with increasing soil strength. Author

N73-13264# IIT Research Inst., Chicago, Ill.
STUDY OF NOISE IN AIR ROUTE TRAFFIC CONTROL CENTER, FLIGHT SERVICE STATION, AIR TRAFFIC CONTROL TOWER AND REMOTE FACILITIES Final Report, 18 Nov. 1971 - 18 May 1972
J. M. Clinch and H. G. Wakeley Oct. 1972 28 p refs
(Contract DOT-FA71WA-2587)
(J-6250; FAA-RD-72-104) Avail: NTIS HC $3.50

Various methods of reducing noise in several FAA air traffic control and navigational facilities that exceed the recommended facility noise criteria are described. Noise control procedures for each facility under consideration are discussed as well as the reasons for selecting specific noise reduction methods. Author

N73-13265*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
DESIGN STUDY OF ARRESTING GEAR SYSTEM FOR RECOVERY OF SPACE SHUTTLE ORBITERS
15 Sep. 1972 105 p
(NASA-TM-X-68881; KSC-TR-1193) Avail: NTIS HC $7.25 CSCL 22D

A plan is reported for the design, manufacture, development, test, and production of an emergency arrestment system for the recovery of shuttle orbiters. Time and cost estimates are included. System testing and several optional test programs are discussed. Author

N73-13266*# Singer Co., Binghamton, N.Y. Simulation Products Div.
SIMULATION TECHNIQUES STUDY Final Report
J. F. Burke 17 Nov. 1972 458 p refs
(Contract NAS9-12836)
(NASA-CR-128653) Avail: NTIS HC $25.00 CSCL 14B

The various techniques that have been used in the field of vehicle simulation and that are likely to be applicable to the flight simulator motion systems are reviewed. Author

N73-13267# CONSAD Research Corp., Pittsburgh, Pa.
A COMMUNITY/AIRPORT ECONOMIC DEVELOPMENT MODEL. VOLUME 2: APPENDICES TO VOLUME 1 Final Report, Apr. 1971 - May 1972
Jere J. Hinkle May 1972 218 p refs
(Contract DOT-FA71WA-2565)
(FAA-EQ-72-3-Vol-2) Avail: NTIS HC $13.00

Data is presented which was assembled during the course of the development of the Community/Airport Economic Development Model (CAEDM). Included are land use category recommendations, land use - aircraft noise level compatibility, zoning recommendations as related to aircraft generated noise, suggested unit costs used for relocation of activities in the airport vicinity, suggested employment categories for model operations, sample measures of support service required for different activities, a discussion and presentation of a derivation of unit rates of consumption of support services of alternative land use activities, and a detailed presentation of the survey of the fourteen airports conducted during the course of the development of the CAEDM. Author

N73-13268# Daresbury Nuclear Physics Lab. (England).
DETAILED DESIGN STUDY FOR THE NINA BOOSTER, VOLUME 1
M. C. Crowley-Milling 1971 186 p refs
(DNPL/R-13) Avail: AEC Depository Libraries

An outline of the results of the work carried out in a design

study on alternatives for using the electron synchrotron NINA as the injector for a higher energy ring is presented. Some aspects are covered by new theoretical work, and for others, prototype equipment was constructed and tested. Design was carried out in sufficient detail to obtain cost estimates reliable enough to allow a choice to be made on economic grounds where technically satisfactory alternatives existed. NSA

N73-13269# United Kingdom Atomic Energy Authority, Harwell (England).
PRELIMINARY EXPERIMENTS WITH AN EVAPORATION NEUTRON SOURCE ON THE VARIABLE ENERGY CYCLOTRON DESIGNED TO SIMULATE FAST REACTOR SPECTRA
S. J. Boot, J. G. Cuninghame, and H. H. Willis May 1972 9 p refs
(AERE-R-6626) Avail: AEC Depository Libraries; UK 50p

A neutron source was constructed for the variable energy cyclotron which provides a neutron spectrum very similar to that of a fast reactor core center. The flux available is sufficient for the performance of on-line fission fragment experiments. The source provides a fast flux of approximately 2 times 10 to the 9th power n/sq cm/sec which, though about a factor of 5 lower than that available at the electron linac/neutron-booster, is suitable for radiochemical irradiation experiments. Useful information concerning the efficiency of various shielding materials for fast neutrons was also obtained. Author (NSA)

N73-13270# Lyon Univ. (France). Inst. de Physique Nucleaire.
STUDY AND DEVELOPMENT OF QUADRUPOLAR FOCUSING LENSES FOR A HELICOIDALLY FOCUSED HEAVY ION ACCELERATOR Ph.D. Thesis
Gabriel Meyrand Nov. 1971 68 p refs In FRENCH
(LYCEN-7179) Avail: AEC Depository Libraries

The results of investigations on quadrupole focusing lenses intended for the drift tubes of the interdigital structure of the Lyon heavy ion accelerator are presented. Curves are given for the different forms chosen. The radius of curvature of the pole for a given pole width and the aberration limit are obtained from these curves. Measurements demonstrate that it is necessary to consider supplementary aberrations due to the extremities of the lens and its imperfect symmetry. A helicoidal system was studied in order to obtain a focusing system requiring less steep magnetic gradients. It is shown that, for an elementary pi/4 rotation, this system, in the most unfavorable case, is equivalent to the ++-- classical system with regard to the acceptance. NSA

N73-13271# Brookhaven National Lab., Upton, N.Y.
INTEGRATED SYSTEMS FOR MAGNETIC SUSPENSION AND PROPULSION OF VEHICLES
G. Danby and J. Powell 1972 6 p refs Presented at Appl. Superconductivity Meeting, Annapolis, Md., 1 May 1971 Sponsored by AEC
(BNL-16909; Conf-720513-7) Avail: NTIS

Integrated magnetic suspension and propulsion system characteristics are discussed. It is concluded that repulsive suspension with linear synchronous motor drive are the most promising. In addition, preliminary results are given for a novel suspension concept which appears to provide strong lifting and restoring forces, large clearance and low drag. Author

N73-13272# Los Alamos Scientific Lab., N.Mex.
LASL INTENSE 14-MeV NEUTRON SOURCE
Dale B. Henderson Jun. 1972 10 p refs
(Contract W-7405-eng-36)
(LA-4863) Avail: NTIS

At least two independent suggestions have been made to build a 14-MeV neutron source at 10 to the 14th power to 10 to the 15th power neutrons/sq cm-sec for materials damage studies related to fusion power reactors. The neutron source utilizes a Cockcroft-Walton accelerator and a windowless gas target for tritium (d,n) neutron production. A feasibility study is proposed in which such a 14 MeV source would be thoroughly investigated. Author (NSA)

N73-13273# Brookhaven National Lab., Upton, N.Y.
BEAM BUNCHING IN THE AGS THROUGH THE USE OF PULSE EXCITED ACCELERATING CAVITIES
J. G. Cottingham 9 Jun. 1972 10 p refs Sponsored by AEC
(BNL-16945; CRISP-72-26) Avail: NTIS

A beam bunching method for bunching the AGS beam for injection into ISABELLE is described. The steps in the process include 1) adiabatically reduce the rf accelerating voltage from 400 to 10 kV; 2) turn on and capture the beam in a pulse excited resonant cavity tuned to 35.6 MHz; 3) decrease the time interval between pulses in a carefully programmed manner; and 4) reenergize the sine wave rf system at 2.59 MHz with 4 kV crest voltage, and then raise the rf voltage adiabatically, compressing the total time width of the beam bunch by a factor of 2.5. NSA

N73-13274# European Organization for Nuclear Research, Geneva (Switzerland).
THE 300 GeV PROGRAMME
14 Jan. 1972 246 p refs
(CERN-1050) Avail: AEC Depository Libraries

The machine lattice; injection system, magnet system; magnet power supplies; acceleration system; vacuum system; correction elements; control system; survey system; radiation protection system; extraction system; experimental areas; site; site installations and buildings; time schedules, manpower requirements, and cost estimates are discussed in detail. Also, the design parameters are listed. NSA

N73-13275# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.
APPARATUS FOR PRODUCING JET TARGETS FROM CONDENSED HYDROGEN WHILE OPERATING ON THE INTERNAL BEAM OF AN ACCELERATOR
V. D. Bartenev, A. A. Belushkina, A. I. Valevich, G. I. Gai, A. M. Gorelov, V. P. Ershov, L. S. Kotova, V. A. Nikitin, Yu. K. Pilipenko, and V. V. Smelyanskii 1972 16 p refs In RUSSIAN
(JINR-P13-6324) Avail: AEC Depository Libraries

The target used jets of condensed hydrogen having the following parameters: diameter-10 mm, duration-about 300 msec, and approximate density-.000001g/cu cm. The processes of hydrogen condensation and the alteration of the vacuum with time of existence of the jet were examined and investigated. Author (NSA)

N73-13276# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.
SYSTEM DESCRIPTION OF THE CENTRAL STATION OF THE GERMAN GROUND STATION NETWORK. FIRST STAGE OF COMPLETION (Z-DBS I) 1968-1970 [RAHMENSYSTEMBESCHREIBUNG DER ZENTRALSTATION DES DEUTSCHEN BODENSTATIONSSYSTEMS ERSTE AUSBAUSTUFE (Z-DBS I) 1968-1970]
Werner Fogy Jan. 1971 163 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(DLR-MITT-71-05) Avail: NTIS HC $10.25; DFVLR, Porz, West Ger. 41,80 DM

On the basis of block diagrams and technical data sheets, the overall technical and scientific lay-out including the German Satellite Operation Network of this station is described. The overall system with its 14 subsystems is used for tracking, telemetering and telecommand of satellites. The antenna system of Z-DBS is designed to operate from a punched-tape-drive control unit on-line to a digital computer. Autotrack and conventional manual modes of operation are also provided for. Author (ESRO)

N73-13277# European Space Research and Technology Center, Noordwijk (Netherlands).
A GENERAL DESCRIPTION OF THE TD-1A SATELLITE GROUND CHECKOUT STATIONS
J. T. Garner Paris ESRO Jul. 1972 25 p
(ESRO-TM-140-ESTEC) Avail: NTIS HC $3.25

The telecommunication subsystem of the TD-1A satellite is summarized together with basic PCM and telecommand principles. The operation of a ground checkout system which receives, decodes, and transmits digital information with the aid of a digital computer is also described. Author (ESRO)

N73-13278# ARO, Inc., Arnold Air Force Station, Tenn.
WIND TUNNEL DESIGN FOR TESTING V/STOL AIRCRAFT IN TRANSITION FLIGHT Final Report
Richard A. Kroeger AEDC Sep. 1972 103 p refs
(Contract F40600-71-C-0002; AF Proj. 69BT)
(AD-749154; ARO-OMD-TR-72-102; AEDC-TR-72-119) Avail: NTIS CSCL 14/2

Wind tunnels have afforded the best potential for studying regions of aerodynamic uniqueness of V/STOL aircraft, but they have been of limited value because of the magnitude of the flow interference they introduce. A new wind tunnel concept is described for covering the spectrum of transition testing from hover throughout wing sustained flight. The wall interference corrections are physically produced by the structure of the wall. A small scale tunnel was designed, constructed, and tested employing this concept. Data from a small rotor model were obtained in the new tunnel and a large conventional one as a basis for comparative evaluation. Author (GRA)

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N73-13279 Engineering Sciences Data Unit, London (England).
PRESSURE LOSSES ACROSS PERFORATED PLATES ORIFICE PLATES AND CYLINDRICAL TUBE ORIFICES IN DUCTS
Jun. 1972 17 p refs Supersedes ESDU-Aero-02.00.02
Sonsored by Roy. Aeron. Soc., Inst. of Chem. Engr., Inst. of Mech. Engr., and Inst. of Structural Engr.
(ESDU-72010; ESDU-AERO-02.00.02) Copyright. Avail: Issuing Activity

Data covering the total— and static— pressure loss coefficients for the pressure drop in fluids flowing through orifice plates, perforated plates, and cylindrical tubes installed in ducts of constant area are presented. The pressure loss results are given in graphs. Author

N73-13280 Engineering Sciences Data Unit, London (England).
PRESSURE DROP IN DUCTS ACROSS ROUND WIRE GAUZES NORMAL TO THE FLOW
Jun. 1972 15 p refs Supersedes ESDU-Aero-02.00.01
Sponsored by Roy. Aeron. Soc., Inst. of Chem. Engr., Inst. of Mech. Engr., and Inst. of Structural Engr.
(ESDU-72009; ESDU-Aero-02.00.01) Copyright. Avail: Issuing Activity

Information on the pressure drop in ducts across round-wire gauzes (or screens) normal to a fluid flow are presented. The pressure drop is dependent upon the gauze geometry, and the velocity, density, Reynolds number and Mach number of the flow. The data are presented in the form of non-dimensional pressure drop coefficients and apply to the flow of liquids and gases. For liquids the effect of compressibility (or Mach number) can be ignored. Author

N73-13281 Engineering Sciences Data Unit, London (England).
FLOW THROUGH A SUDDEN ENLARGEMENT OF AREA IN A DUCT
Jun. 1972 14 p refs Supersedes ESDU-Aero-00.03.29
Sponsored by Roy. Aeron. Soc., Inst. of Chem. Engr., and Inst. of Structural Engr.
(ESDU-72011; ESDU-Aero-00.03.29) Copyright. Avail: Issuing Activity

Pressure changes occurring in the flow of fluids along a duct with a sudden enlargement of area are considered. The data for incompressible flow are presented in non-dimensional form as total-and static-pressure loss coefficients for uniform flow and non-uniform flow. For uniform compressible flows the downstream Mach number, total-pressure loss coefficient and static-pressure ratio are illustrated. The values given represent the overall changes between the plane of the enlargement and the recovery plane and are therefore strictly applicable only to sudden enlargements with that length of duct downstream. However, for values of the area ratio near to 0 or near to 1, this restriction may be relaxed and the data applied to shorter ducts. Author

N73-13282 Engineering Sciences Data Unit, London (England).
FRICTION LOSSES FOR FULLY DEVELOPED FLOW IN STRAIGHT PIPES
Sep. 1966 26 p refs Sponsored by Inst. Mech. Engr. and Roy. Aeron. Soc.
(ESDU-66027) Copyright. Avail: Issuing Activity

The calculation of frictional pressure losses associated with the flow of fluids in straight pipes running full is reported. Data are given for both laminar flow and turbulent flow for a range of values of surface roughness. Both circular and non-circular cross sections are considered. Three methods of solution for pipe flow problems are outlined. Their distinguishing features are: (1) chart relating all the quantities involved by means of four dimensionless groups; (2) formulae for calculating the friction factor; (3) a friction factor - Reynolds number chart. Author

N73-13283 Engineering Sciences Data Unit, London (England).
INTERACTION FACTORS FOR CALCULATING PRESSURE LOSSES FOR INCOMPRESSIBLE FLOW IN SOME COMBINATIONS OF TWO BENDS IN SERIES
Jul. 1968 11 p refs Sponsored by Inst. Mech. Engr. and Roy. Aeron. Soc.
(ESDU-68035) Copyright. Avail: Issuing Activity

The calculation of pressure loss due to bends in fluid flow systems is discussed. Values of a correction factor, beta, which relates the overall loss for some combinations of two bends in series to the sum of the losses for individual bends in the reference-free flow are presented. Application of the data to the flow of fluids and to the flow of gases at low Mach numbers is explained. Mathematical models are included to clarify the theoretical aspects. Author

N73-13284 Engineering Sciences Data Unit, London (England).
CASCADES OF GUIDE VANES FOR 90 DEG ELBOWS
Jul. 1967 4 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-AERO-00.02.09) Copyright. Avail: Issuing Activity

Dimensions of cascades of flat plate guide vanes suitable for general engineering use in 90 deg elbows in ducts of circular cross section are presented. The basic design formulas on which the data are based, should be used for ducts of diameters different from those considered in Table 1. These data, are a modification to the design in Derivation 5. In Derivation 5 the vane profile was parabolic. This has been replaced by a profile based on circular arc curvature, with leading- and trailing-edge extensions which are bevelled. A feature of the design is the variation of the pitch between adjacent vanes across the duct in the form of an arithmetic progression. The number of vanes is reduced toward the outside of the bend where the influence of the wall aids the turning of the flow. The adaption of the design to ducts of rectangular cross section is straightforward. Author

N73-13285 Illinois Univ., Urbana.
THE EFFECT OF EXTERNAL DISTURBANCES ON THE NEAR WAKES OF BLUNT BASED BODIES IN SUPERSONIC FLOW Ph.D. Thesis
Larry Brent Morgan 1971 109 p
Avail: Univ. Microfilms Order No. 72-7007

The effect on base pressure of external shocks or expansions which intersect the wake of a two-dimensional blunt based body in supersonic flow is predicted analytically and compared with experimental results. External shocks were generated by simple wedges, and combinations of shocks and expansions were generated by compound edges and liquid injection. These external disturbances were caused to intersect a wake at various positions. The potential of external disturbances generated by supersonic combustion to increase base pressure is shown by calculations using an analytical model of supersonic combustion. The supersonic combustion model is composed of two parts, the fuel injection and the heat addition. The flow field caused by liquid injection was found using the injection shock shape. The distribution of heat addition and resulting flow field were based upon the history of a representative fuel drop. Dissert. Abstr.

N73-13286 Tennessee Univ., Knoxville.
A COMBINED POTENTIAL AND MOMENTUM ROLL-UP MODEL FOR THE JET IN CROSS FLOW Ph.D. Thesis
Roger Allen Crawford 1971 115 p
Avail: Univ. Microfilms Order No. 72-5430

The roll-up of the turbulent circular jet exhausting normal to the cross flow was investigated by flow visualization techniques and analytic studies. The jet flow field was divided into three regions; development region, momentum entrainment region, and trailing vortex region. A roll-up model defined by the jet trailing vortex strength was developed for each region of the jet. A modified three-dimensional potential roll-up model was developed to predict the trailing vortex strength in the development region. The trailing vortex strength in the momentum entrainment region was derived from a moment of momentum model. Conservation of linear and angular momentum was used to relate the trailing vortex strength to the moment of momentum flux in the jet. The experimental investigation confirmed the accuracy of the potential roll-up model in predicting cross section deformation of the jet. Flow visualization was also used to confirm the flow field assumption from the moment of momentum development. The trailing vortex strength predicted by both models was shown to be a linear function of jet to cross flow velocity ratio. Dissert. Abstr.

N73-13287 Stanford Univ., Calif.
NUMERICAL CALCULATION OF A SUPERSONIC THREE DIMENSIONAL JET PLUME Ph.D. Thesis
Ricardo Alfredo Bastianon 1971 66 p
Avail: Univ. Microfilms Order No. 72-5886

A method is presented for calculating a supersonic three-dimensional jet plume, generated by a slant conical nozzle with its exit section not perpendicular to the nozzle axis. An under-expanded supersonic three-dimensional jet in which the fluid is a perfect gas and is inviscid and compressible is considered. The three-dimensional equations of motion are solved by a numerical procedure in a step by step fashion, marching in the downstream direction from the nozzle exit. An initial shock-free region is considered to be close to the exit and at a finite distance from the nozzle exit, the field is split in two regions, an internal core bounded by the shock wave surface and an external ring between the shock wave and the jet boundary.
Dissert. Abstr.

N73-13288*# Alabama Univ., University. Bureau of Engineering Research.
AN INVESTIGATION OF THE UNSTEADY FLOW ASSOCIATED WITH PLUME INDUCED FLOW SEPARATION Final Report
Andrew L. Boggess, Jr. Jul. 1972 67 p refs
(Grant NGR-01-022-981)
(NASA-CR-112218; BER-149-02) Avail: NTIS HC $5.50 CSCL 20D

A wind tunnel study of the basic nature of plume induced flow separation is reported with emphasis on the unsteady aspects of the flow. Testing was conducted in a 6 inch by 6 inch blow-down supersonic wind tunnel. A cone-cylinder model with a pluming jet was used as the test model. Tests were conducted with a systematic variation in Mach number and plume pressure. Results of the tests are presented in the form of root-mean-squared surface pressure levels, power spectral densities, photographs of the flow field from which shock angles and separation lengths were taken, and time-averaged surface pressure profiles.
Author

N73-13289# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
CORRELATIONS FOR MEAN VELOCITY PROFILES IN THREE-DIMENSIONAL INCOMPRESSIBLE TURBULENT BOUNDARY LAYERS
T. S. Prahlad Oct. 1971 69 p refs
(Rept-71-FM-13) Avail: NTIS HC $5.50

Some aspects of mean velocity profiles in three-dimensional turbulent boundary layers in the incompressible case are considered. Data obtained in four experimental configurations and described in a companion report are used in most of the analysis. It is pointed out that, depending upon the local pressure gradient, there is a possibility of a significant variation in flow angle across the viscous sublayer and a rough estimate of this change is obtained. Changes that occur in crossflow profiles downstream of streamline inflexion points and close to separation are described. It is shown that the two-dimensional profile family of Thompson describes well the profile components both in the streamwise and wall flow directions. Author

N73-13290*# Bell Aerospace Co., Buffalo, N.Y.
DEVELOPMENT AND APPLICATIONS OF SUPERSONIC UNSTEADY CONSISTENT AERODYNAMICS FOR INTERFERING PARALLEL WINGS: USER'S MANUAL
Andrew A. Paine Washington NASA Aug. 1972 54 p refs
(Contract NAS1-10880)
(NASA-CR-112184; Rept-2471-941001) Avail: NTIS HC $4.75 CSCL 20D

The input data required to execute the computer program AIC/INT (aerodynamic influence coefficients with interference) are presented. The purpose of the computer program is to generate aerodynamic forces for a pair of plane and interfering nearly parallel, non-coplanar wings at supersonic Mach numbers. A finite element technique has been employed. Planforms are described by triangular elements and diaphragm regions are generated automatically. Author

N73-13291*# Bell Aerospace Co., Buffalo, N.Y.
DEVELOPMENT AND APPLICATIONS OF SUPERSONIC UNSTEADY CONSISTENT AERODYNAMICS FOR INTERFERING PARALLEL WINGS: PROGRAMMER'S MANUAL
Andrew A. Paine Aug. 1972 123 p
(Contract NAS1-10880)
(NASA-CR-112185) Avail: NTIS HC $8.25 CSCL 20D

The computer program written in support of the problem to determine aerodynamic influence coefficients on parallel interfering wings is described. The information is geared to the programmer. It is sufficient to describe the program logic and the required peripheral storage. Author

N73-13292# Joint Publications Research Service, Arlington, Va.
HYDRAULIC JET FLOW OF AN IDEAL LIQUID AND GAS-LIQUID MIXTURES
20 Oct. 1972 36 p refs Transl. into ENGLISH from Gidromekhaniya (Kiev), no. 19, 1971 p 3-24
(JPRS-57308) Avail: NTIS HC $4.00

Papers are presented on reaction engines and on a hot air bubble cooling in a liquid. For individual titles, see N73-13293 through N73-13295.

N73-13293 Joint Publications Research Service, Arlington, Va.
PERFORMANCE OF A REACTION ENGINE WITH AN EJECTOR SHROUD **c28**
G. V. Logvinovich *In its* Hydraulic Jet Flow of an Ideal Liquid and Gas-Liquid Mixtures 20 Oct. 1972 p 1-10 (For availability see N73-13292 04-12)

Mathematical equations are given for designing an efficient water/steam reaction engine with ejector shrouds. The engine without shrouds is considered first, and then with shrouds having different streamlining. Different modes of operation, drag, and internal resistance are also described. N.E.N.

N73-13294 Joint Publications Research Service, Arlington, Va.
NUMERICAL SOLUTION TO THE PROBLEM OF COOLING A HOT GAS BUBBLE IN LIQUID **c33**
V. M. Ivchenko, N. A. Prikhodko, and V. S. Siryy *In its* Hydraulic Jet Flow of an Ideal Liquid and Gas-Liquid Mixtures 20 Oct. 1972 p 11-18 refs (For availability see N73-13292 04-12)

Equations are developed to describe the thermal and dynamic interactions of gas bubbles with the surrounding fluid. With given assumptions limiting the conditions, a differential-difference equation for the cooling of a hot air bubble is obtained, and calculations are made with the aid of a digital computer.
N.E.N.

N73-13295 Joint Publications Research Service, Arlington, Va.
ON THE THEORY OF GAS-HYDRAULIC PROPULSION ENGINES **c28**
I. M. Chernyy, N. A. Prikhodko, and Yu. G. Mokeyev *In its* Hydraulic Jet Flow of an Ideal Liquid and Gas-Liquid mixtures

20 Oct. 1972 p 19-32 refs (For availability see N73-13292 04-12)

The theory of direct reaction engines for water surface vessels is described. The engine uses air and outboard water as the working medium. It is concluded that the efficiency depends on the gas phase expansion process in the air-water mixture. The admixture of outboard water can provide a gain in thrust of up to 50% to 100% at operating speeds of 50 m/sec. N.E.N.

N73-13296*# Scripta Technica, Inc., Washington, D.C.
WALL JET AT A CURVED SURFACE
N. N. Kortikov, M. Z. Zhivov, and Yu. A. Sokovishin Washington NASA Dec. 1972 4 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (Moscow), v. 22, May 1972 p 881-884
(Contract NASw-2036)
(NASA-TT-F-13924) Avail: NTIS HC $3.00 CSCL 20D

The results of a numerical computation of the propagation of a plane submerged jet at a curved surface are discussed. The growth of the boundary layer and the frictional stresses at convex and concave surfaces are described. Author

N73-13297# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
SOME IMPORTANT PARAMETRIC RELATIONS FOR ORDINARY AND CONFLUENT TURBULENT BOUNDARY LAYER FLOWS
Suresh H. Goradia and Gene T. Colwell 30 Jul. 1971 58 p refs Backup document for AIAA Synoptic, "Parametric relations for Ordinary and Confluent Turbulent Boundary Layer Flows", scheduled for publication AIAA Journal in May 1973
Avail: NTIS HC $5.00

Some important parameters encountered in turbulent wall jet flow with external stream velocity and arbitrary pressure distribution of practical interest are discussed. Parametric representation of the experimental data is achieved using the principal of local dynamic similarity. Analytical expressions for eddy viscosity and eddy diffussivity for ordinary turbulent boundary layer flow on a flat plate are presented and comparisons are made with experimental data obtained in this study. Eddy viscosity distributions for confluent boundary layer flow, calculated from experimental velocity profiles, are presented for various conditions. Author

N73-13298*# Stanford Research Inst., Menlo Park, Calif.
CORRELATION TECHNIQUES AND MEASUREMENTS OF WAVE-HEIGHT STATISTICS
H. Guthart, W. C. Taylor, K. A. Graf, and D. G. Douglas Washington NASA Dec. 1972 52 p refs
(Contract NAS1-10681; SRI Proj. 1183)
(NASA-CR-2153) Avail: NTIS HC $3.00 CSCL 20D

Statistical measurements of wave height fluctuations have been made in a wind wave tank. The power spectral density function of temporal wave height fluctuations evidenced second-harmonic components and an f to the minus 5th power law decay beyond the second harmonic. The observations of second harmonic effects agreed very well with a theoretical prediction. From the wave statistics, surface drift currents were inferred and compared to experimental measurements with satisfactory agreement. Measurements were made of the two dimensional correlation coefficient at 15 deg increments in angle with respect to the wind vector. An estimate of the two-dimensional spatial power spectral density function was also made. Author

N73-13299*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
STUDY OF CAVITATING INDUCER INSTABILITIES Final Report, 1 Jul. 1971 - 15 May 1972
W. E. Young, R. Murphy, and J. M. Reddecliff 31 Aug. 1972 163 p refs
(Contract NAS8-27625)
(NASA-CR-123939; PWA-FR-5131) Avail: NTIS HC $10.25 CSCL 20D

An analytic and experimental investigation into the causes and mechanisms of cavitating inducer instabilities was conducted. Hydrofoil cascade tests were performed, during which cavity sizes were measured. The measured data were used, along with inducer data and potential flow predictions, to refine an analysis for the prediction of inducer blade, suction surface cavitation cavity volume. Cavity volume predictions were incorporated into a linearized system model, and instability predictions for an inducer water test loop were generated. Inducer tests were conducted and instability predictions correlated favorably with measured instability data. Author

N73-13300# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
ION DISSIPATION IN HIGH MACH NUMBER OBLIQUE SHOCKS
D. Biskamp and H. Welter Feb. 1972 34 p refs
(IPP-6/102) Avail: AEC Depository Libraries

Numerical simulations have provided detailed information of the microscopic processes that occur in a high Mach number oblique shock wave such as the bow shock. The gross feature of the ion dissipation is a strong interaction of the reflected ions with the whistler precursor, which can be explained by a nonlinear ion-ion counterstreaming instability. The instability simultaneously amplifies the magnetic oscillations of the whistler which supports the strong magnetic turbulence at the bow shock. In addition, electrostatic substructures were observed that significantly enhance the thermalization of the ion distribution on the Debye scale. Author (NSA)

N73-13301# Kiel Univ. (West Germany). Inst. fuer Experimental Physik.
INVESTIGATION OF STRONG SHOCK WAVES, PRODUCED IN A DIAPHRAGM SHOCK TUBE
G. Meinhold May 1972 99 p refs In GERMAN; ENGLISH summary
(BMBW-FBK-72-5) Avail: AEC Depository Libraries

An investigation was performed using 70-GHz microwaves on shock-heated monatomic gases (Ar, Kr). The shock wave generates a nonequilibrium plasma. Information about the ionization mechanism is obtained by electron-density measurements. In the electron-density range under investigation, the ionization rates are controlled by atom-atom collisions only. The increase of electron temperature with time was measured with sufficient accuracy. Author (NSA)

N73-13302# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Angewandte Gasdynamik.
NUMERICAL CALCULATIONS OF THE FLOW FIELD OF LOW REYNOLDS NUMBER VISCOUS FLOW WITH OR WITHOUT REAL-GAS EFFECTS IN SLENDER-CHANNEL NOZZLES
N. K. Mitra and M. Fiebig Sep. 1972 31 p refs Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-110) Avail: NTIS HC $3.75

Flow field calculations based on slender channel approximations have been carried out for low Reynolds number, high enthalpy viscous flow of a diatomic gas through conical nozzles. The existence of a saddle point in the flow field is observed and the calculations are extrapolated through this saddle point. An implicit finite difference scheme is used for the calculations. Investigations are being carried on to study the effect of vibrational nonequilibrium on the flow through nozzles. So far two cases of equilibrium flow have been studied - the first with constant specific heat and the second with variable specific heat. Results show that the mass flow rates through the nozzles are approximately proportional to the ratio of specific heats. The mass flow rate is larger in a cold wall nozzle. Author (ESRO)

N73-13303# Stuttgart Univ. (West Germany). Inst. fuer Aerodynamik und Gasdynamik.
AN EXPLICIT DIFFERENCE METHOD FOR STEADY HYPERSONIC FLOW [EIN EXPLIZITES DIFFERENZENVERFAHREN FUER DIE STATIONAERE UEBERSCHALLSTROEMUNG]
K. Foerster Sep. 1972 18 p refs In GERMAN Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-66) Avail: NTIS HC $3.00

An explicit difference method is designed for steady two dimensional or axisymmetric hypersonic flow, and extended to include the boundary condition for solid walls. Its accuracy for simple cases is compared with analytic, known exact solutions, and in one case also with the analytic characteristic method of

Ostvatitsch (flat plate under an angle, and conical flow). Other examples with polar profiles, and rocket nose cones, are given to show the applicability to complicated flow problems. The advantages of the method are the applicability to arbitrary anisotropic flows, simple programmability, adaptability and short computing times. Accuracy is within technical limits for axisymmetric flows, and at least an order of matnitude better for plane flows. Author (ESRO)

N73-13304# Institut Franco-Allemand de Recherches, St. Louis (France).
TRANSONIC FLOW AROUND A SLENDER BODY [ECOULEMENT TRANSSONIQUE SUR CORPS ELANCE]
M. Giraud 15 Nov. 1971 21 p refs In FRENCH; ENGLISH summary Presented at the 8th Colloq. on Appl. Aerodyn., Saint-Louis, France, 8-10 Nov. 1971; sponsored by Assoc. Franc. des Ingr. et Techniciens de l'Aeron. et l'Espace
(ISL-33/71) Avail: NTIS HC $3.25

The transonic flow around slender bodies was studied by means of wind tunnel tests of various fin stabilized bodies of revolution. The phenomena associated with the transonic flow around slender bodies are outlined. The influence of deceleration on wave drag and the effect of pendulation on the boundary layer transition are examined in detail. Author (ESRO)

N73-13305# Institut Franco-Allemand de Recherches, St. Louis (France).
BLAST WAVE PROPAGATION IN TUNNELS [PROPAGATION DES ONDES DE SOUFFLE EN GALERIE]
C. Thery, L. Bobin, and G. Jaeggy 15 Nov. 1971 21 p refs In FRENCH Presented at the 8th Colloq. on Appl. Aerodyn., Saint-Louis, France, 8-10 Nov. 1971; sponsored by Assoc. Franc. des Ingr. et Techniciens de l'Aeron. et de l'Espace
(Contract DTEN-71.70.181)
(ISL-36/71) Avail: NTIS HC $3.25

The attenuation of blast wave propagation in tunnels due to viscous effects associated with wall roughness and nonviscous effects due to the overlapping of shock fronts by relaxation waves is investigated. A computer program is proposed which is based on the method of characteristics, but air is considered as a perfect gas. The results obtained by this method agree with previous experimental results. The experimental study of high intensity blasts propagation is envisaged using a light gas gun as a blast generator. It is pointed out that to apply this calculation method to two dimensional problems, a mixed program combining the finite difference method with the method of characteristics should be used. Author (ESRO)

N73-13306# Institut Franco-Allemand de Recherches, St. Louis (France).
CONTRIBUTION TO THE STUDY OF THE BOUNDARY LAYER BEHIND A SHOCK WAVE [CONTRIBUTION A L'ETUDE DE LA COUCHE LIMITE DERRIERE UNE ONDE DE CHOC]
G. Jaeggy 4 Feb. 1972 52 p refs In FRENCH
(Contract DTAT-CEG-401/154/22)
(ISL-5/72) Avail: NTIS HC $4.75

The characteristic parameters of a laminar and a turbulent boundary layer generated by a shock wave as a function of the wave intensity were calculated, taking into consideration the existence of the boundary layer in the flow behind the shock, and viscosity phenomena. The conditions under which the calculation can be done without boundary layer treatment were determined as a first step, and the parameters to be inserted in a computer program in order to take into account the existence of the boundary layer were included. Author (ESRO)

N73-13307# Institut Franco-Allemand de Recherches, St. Louis (France).
PROPAGATION AND ATTENUATION OF BLAST WAVES IN TUNNELS [PROPAGATION ET ATTENUATION DES ONDES DE SOUFFLE EN GALERIE]
L. Bobin and C. Thery 28 Apr. 1972 25 p refs In FRENCH Presented at the 3d Intern. Symp. on Military Appl. of Blast Simulators, Schwetzingen, West Ger., 19-21 Sep. 1972
(Contract DTEN-71.70.181)
(ISL-11/72) Avail: NTIS HC $3.25

Propagation of blast waves in tunnels was investigated. Shock wave attenuation occurs due to the initial wave profile as well as viscous friction at the walls. A computer program to study the propagation of a 100 bar wave is proposed which takes into account the initial pressure profile of the blast, air viscosity, and wall roughness. The experimental results obtained agree with previous experiments. The computer program will be adapted to the study of high intensity blasts using Mollier diagrams. However to control viscous characteristics of the air at high pressures and high temperature, an experiment is proposed which will generate 300 bar blasts in 20 to 30 mm diameter tunnels, in order to control the viscosity characteristics of the air.
Author (ESRO)

N73-13308# Wisconsin Univ., Madison. Mathematics Research Center.
A POSTERIORI ERROR BOUNDS FOR A BOUNDARY LAYER
Karl L. Nickel Jun. 1972 55 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-748771; MRC-TSR-1143) Avail: NTIS CSCL 20/4

The two dimensional steady laminar boundary layer of an incompressible medium at a wall is treated. For a given approximate solution of the Prandtl equation error bounds are computed with the aid of parabolic inequalities. Also bounds for the wall shear stress, for the displacement thickness, for the momentum loss thickness and for the energy loss thickness are given. The bounds converge toward zero if the residual error and the initial error of the approximation both vanish.
Author (GRA)

N73-13309# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace Engineering.
DECOMPOSITION OF A LIQUID JET INJECTED NORMAL TO A SUPERSONIC AIR STREAM Interim Report
Edward A. Kush, Jr. and Joseph A. Schetz Jun. 1972 257 p refs
(Grant AF-AFOSR-1875-70; AF Proj. 9711)
(AD-747494; VPI-E-72-10; AFOSR-72-1180TR) Avail: NTIS CSCL 20/4

A systematic experimental study of the breakup of a liquid jet injected normal to a supersonic airstream was carried out. Included were the effect of liquid properties, jet flow rate, dynamic pressure ratio, Mach number (2.4 to 4.0), boundary layer thickness upstream of the jet, orifice size and shape, and level of jet back pressure relative to liquid vapor pressure. High-frequency, axially-propagating waves are studied as the principal decomposition mechanism, since in their instability they grow along the curved jet to a point where a large clump of fluid detaches from the cohesive jet at a wave-trough. The wave process was studied extensively by use of high-speed photographic techniques.
Author (GRA)

N73-13310# Michigan Univ., Ann Arbor. Dept. of Engineering Mechanics.
A MODEL FOR RAIN EROSION OF HOMOGENEOUS MATERIALS Technical Report, Jun. 1971 - May 1972
George S. Springer and Chandrakant B. Baxi Wright-Patterson AFB, N. Y. AFML Jun. 1972 64 p refs
(Contract F33615-71-C-1572; AF Proj. 7340)
(AD-748790; AFML-TR-72-106) Avail: NTIS CSCL 20/4

The behavior of homogeneous materials subjected to repeated impingements of liquid droplets is investigated. Based on fatigue theorems, a model is presented for describing both the incubation period ni(i.e. the time elapsed before the mass loss of the material becomes appreciable), and the mass loss past the incubation period m. The parameters are established which govern the length of the incubation period and the subsequent mass loss rate, and simple algebraic expressions are developed relating ni and m to the properties of the impinging droplets and the material. The limits of applicability of the model are also established.
Author (GRA)

N73-13311# Naval Research Lab., Washington, D.C. Mathematics Research Center.
STEADY STATE SOLUTIONS OF DISCRETE-VELOCITY BOLTZMAN SYSTEMS IN RESTRICTED FLOW REGIONS Final Report
Howard E. Conner 30 Jun. 1972 44 p refs
(AD-748182; Rept-72-2) Avail: NTIS CSCL 20/4

The existence of steady-state solutions is established for discrete-velocity Boltzmann systems in a restricted flow region. The principal result states that such solutions exist and are positive provided that the boundary scattering operator does not distort the associated kinetic equilibrium solutions too much. The steady-state solutions are represented as perturbations of kinetic equilibrium solutions. Author (GRA)

N73-13312# Ballistic Research Labs., Aberdeen Proving Ground, Md.
MEASUREMENT OF ELECTRON CONCENTRATION IN AN AXISYMMETRIC NONEQUILIBRIUM SHOCK LAYER
F. H. Oertel, Jr. Jun. 1972 46 p refs
(DA Proj. 1T0-61102-A-33-D)
(AD-748833; BRL-1594) Avail: NTIS CSCL 20/4

The report describes an experiment to map the electron number density distribution in a nonequilibrium shock layer in which kinetic and radiative processes are coupled to gasdynamics. The experimental method is two-wavelength interferometry using a Mach-Zehnder optical interferometer backlighted by a giant pulse ruby laser. On the stagnation streamline agreement was observed between the maximum measured electron number density and the value computed for ionization equilibrium, accounting for experimental error and the lowering of ionization potential. Author (GRA)

N73-13313# General Motors Corp., Indianapolis, Ind. Diesel Allison Div.
THREE-DIMENSIONAL, SUBSONIC, DUCT FLOW ANALYSIS Final Report
May 1972 73 p refs
(Contract N00019-71-C-0416)
(AD-748649; EDR-7451) Avail: NTIS CSCL 20/4

The three-dimensional flow analysis research taken in conjunction with other elements of the Allison Flow Analysis Program; such as boundary layer, supersonic flow and transonic flow analysis research; offers an avenue to revolutionary improvements and optimization in aerodynamic design which would otherwise be too expensive to undertake. Author (GRA)

N73-13314# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A UNIQUENESS THEOREM FOR NONSTATIONARY BOUNDARY LAYERS
K. L. Nickel 1 Dec. 1971 15 p refs Transl. into ENGLISH from Math. Z. (West Germany), no. 74, 1960 p 209-220
(AD-748743; FTD-HC-23-1546-71) Avail: NTIS CSCL 20/4

The article derives a uniqueness theorem for nonstationary boundary layers. Author (GRA)

N73-13315# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SEVERAL CHARACTERISTICS OF THE GAS FLOW MOVEMENT IN A DENSE LAYER
V. V. Chukin and R. F. Kznetsov 22 May 1972 8 p refs Transl. into ENLGISH from Izv. Vyssh. Vcheb. Zaved., Chern. Met. (Moscow), v. 12, no. 12, 1969 p 139-140
(AD-747829; FTD-HC-23-98-72) Avail: NTIS CSCL 20/4

The measurement of gas velocities in a filter is briefly analyzed by gas dynamic equations. GRA

N73-13316# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
FLUID RESPONSE TO PLATE IMPACT M.S. Thesis
John R. Easter Jun. 1972 70 p refs
(AD-748340; GAW/MC/72-6) Avail: NTIS CSCL 13/4

A theoretical means of obtaining the pressure field between two infinite elastic plates one of which is excited by periodic pulses applied at a point is developed. The Timoshenko-Mindlin plate equation, which includes the effects of rotatory inertia and shear deformation, is used to describe the motion of each of the plates. The fluid between the plates is assumed to be compressible and inviscid and is described by the fluid wave equation. The solution is obtained by use of Hankel transforms. The inverse Hankel transform is obtained by numerical integration and by an approximation using the method of steepest descent. Satisfactory agreement between the two sets of results were found for pulse lengths on the order of ten microseconds. Author (GRA)

N73-13317# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN APPROXIMATE VELOCITY POTENTIAL FOR A SLENDER BODY OF ELLIPTIC CROSS SECTION IN AN IDEAL AIRSTREAM M.S. Thesis
Michael D. Pavich Jun. 1972 54 p refs
(AD-748353; GAW/MC/72-13) Avail: NTIS CSCL 20/4

The study is an analysis to examine the validity of a small perturbation approximation technique for determining the aerodynamic forces of a slender body of noncircular cross-section. The approach used was to apply the technique to a problem that could also be solved exactly. The problem chosen was a corrugated cylinder of infinite length and elliptic cross-section in an irrotational ideal air stream. The governing equation and boundary conditions for a corrugated elliptic cylinder are transferred to elliptic coordinates and solved exactly by separating the variables. Comments are given on improving the accuracy and extending the range of the approximation used, and recommendations are made for further study. Author (GRA)

N73-13318# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EXPERIMENTAL STUDY OF ATTENUATION OF SHOCK WAVES IN THREE MIXTURES M.S. Thesis
James W. Clark, Jr. Jun. 1972 84 p refs
(AD-748350; GAW/MC/72-3) Avail: NTIS CSCL 13/4

Two experiments were conducted to determine the effects of adding a gas to a foam-water mixture to increase the attenuation of shock waves caused by hydraulic ram. In each experiment three target materials were impacted: water, water and reticulated polyurethane foam, and water and Pneumacel. Pneumacel is a Du Pont tradenamed product consisting of Dacron fibers inflated 12% by weight Freon gas. In the first experiment, plane (one dimensional) shock waves were generated by impacting the target materials with a flat aluminum disc. In the second experiment, 1/2 inch spheres were fired into the target materials. In each experiment pressures were measured at various depths in each mixture for several impact velocities. Author (GRA)

N73-13319# Army Hospital, Fort Jackson, S.C.
RESEARCH IN INHOMOGENEOUS TURBULENT WAKE FLOWS. PART 2: ELASTIC JELLY MODEL Progress Report
Joshua Menkes, Carlton Hindman, and Sreedhar-Rao 5 Jun. 1972 15 p ref
(Contract DAHC04-70-C-0040)
(AD-746990) Avail: NTIS CSCL 20/4

The report deals with an inviscid stream flowing over an elastic jelly with an appropriate rigidity n. In response to the initial disturbances, the turbulent fluid develops Reynolds stresses which persist after an element of fluid passes into a different environment. Development of a dispersion relation examines the response of the turbulent fluid to small perturbations of the boundary, assuming that the turbulent fluid behaves like an elastic jelly, and examines the response spectrum. The external parameter is the stiffness number which is based on the fluid velocity and elastic rigidity of the medium. GRA

N73-13320# California Univ., Berkeley. Fluid Mechanics Div.
MEASUREMENT OF HYPERSONIC NEARLY FREE MOLECULE SPHERE DRAG AT SEVERAL WALL TEMPERATURE RATIONS Ph.D. Thesis
Thomas E. Chamberlain Mar. 1972 95 p refs
(Contract N00014-69-A-0200-1021)
(AD-748618; FM-72-2) Avail: NTIS CSCL 20/4

Hypersonic low density sphere drag measurements were made in a nitrogen free jet at wall-to-total temperature ratios of 0.18, 0.66 and 1.0 and Knudsen numbers, based on the reflected molecule mean free path, of 0.5 to 17. The drag forces were measured with a displacement balance. A cryogenic momentum flow rate probe developed in this research was used to calibrate the free jet. Model temperatures were measured with an attached thermocouple. A parametric relationship which correlates variable wall temperature sphere drag data in the

hypersonic near free molecule regime is introduced.
Author (GRA)

N73-13321# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
GENERALIZED FLOW IN AN ANNULAR GAP OF A VISCOPLASTIC LIQUID WITH TEMPERATURE DEPENDENT VISCOSITY
S. A. Bostandzhiyan and A. M. Stolin 16 Jun. 1972 24 p refs Transl. into ENGLISH from the book "Reofiz. i Reodinam. Tekuchikh Sistem" Minsk, Izd. Nauk. Tekh., 1970 p 122-135
(AD-748908; FTD-HT-23-577-72) Avail: NTIS CSCL 20/4

Investigation is reported of the nonisothermal stationary flow of a viscoplastic liquid between two concentric cylinders. The outer cylinder rotates with constant angular velocity, and there is a pressure gradient acting in a tangential direction in the gap. The limiting shear stress is constant, and the temperature dependence of viscosity is described by a hyperbolic law. Various flow regimes are examined, and attention is given to the effects of heat exchange. Formulas are derived for the temperature and angular velocity profiles, and ranges of parameters corresponding to different flow regimes are delineated. Author (GRA)

N73-13322# New York Univ., N.Y. Dept. of Aeronautics and Astronautics.
A MODEL FOR THE ANALYSIS OF VISCOUS INVISCID INTERACTION EFFECTS ON BLUNT BODIES IN HYPERSONIC FLIGHT
Andrew Srokowski and Gabriel Miller Jun. 1972 92 p refs
(Contract N00014-67-A-0467-0021)
(AD-748342; NYU-AA-72-10) Avail: NTIS CSCL 20/4

A model for the study of viscous inviscid interactions is presented. The boundary layer equations are solved by means of an implicit finite difference scheme; the supersonic portion of the flow is calculated by characteristics including viscous terms, and the two sections of the flow matched. The possibility of a non-zero normal pressure gradient in the boundary layer is taken into account by the analysis. A shock point calculation which includes the effects of viscosity behind the shock is presented. The method is applied to a two-dimensional blunt body in hypersonic flight, and the significance of the model for high curvature and low Reynolds number conditions is discussed. A listing of the computer program which generated these results is included in the report. Author (GRA)

N73-13323# Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.
THREE DIMENSIONAL LAMINAR BOUNDARY LAYERS Annual Status Report, 1 Jul. 1971 - 30 Jun. 1972
K. C. Wang Aug. 1972 16 p
(Contract F44620-70-C-0085)
(AD-748282; AFOSR-72-1684TR) Avail: NTIS CSCL 20/4

Research efforts were mainly directed to developing the computer program which will calculate genuine three-dimensional boundary layer, especially that over an inclined body of revolution.
Author (GRA)

N73-13324# Naval Postgraduate School, Monterey, Calif.
HOLOGRAPHIC INTERFEROMETRY OF THE FLOW FIELD BETWEEN A FIN AND FLAT PLATE M.S. Thesis
Robert Ward Heyer Mar. 1972 178 p refs
(AD-749048) Avail: NTIS CSCL 20/4

An attempt was made to map the density field in a fin-flat plate junction three-dimensionally using holographic interferometry. The investigation has extended previous density studies to include, for the first time, interferometric fringe information obtained through a transparent model in supersonic flow. Feasibility of the method was demonstrated. The factors which are thought to have limited the success of the experiment include vibration of the model, fluctuations of the tunnel flow and size of the model in relation to the size of the wind tunnel test section. Schlieren photography was used to look through and around the model and to verify that the same flow was established as was reported by other investigators.
Author (GRA)

N73-13325# Naval Postgraduate School, Monterey, Calif.
INTERACTION OF SEMI-CONFINED TURBULENT JETS Final Report
Turgut Sarpkaya 8 Aug. 1972 110 p refs
(AD-749023; NPS-59SL72081A; AROD-8675-2-E) Avail: NTIS CSCL 13/7

The report is concerned with the theoretical and experimental study of the interaction of semi-confined, subsonic, turbulent jets, the application of the results to fluidics being one of the primary objectives in mind. The theoretical results obtained both through the use of the free-streamline theory and a new momentum analysis for both the single and symmetric control-jet configurations are presented in the first part of the report. The second part covers the detailed experimental investigations of the jet deflection and the velocity-and turbulence-profile measurements obtained with a hot-wire anemometer for both the single-control-jet and summetric beam-deflection type amplifiers. Finally, the results of the two parts of the study are compared and the advantages and shortcomings of the various analyses are presented. Author (GRA)

N73-13326# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
ATOMIC COLLISIONAL RATE AND IONIZATION RELAXATION STUDY IN A HELIUM SHOCK WAVE Interim Report
Satya Pal Kalra Mar. 1972 98 p refs
(Grant AF-AFOSR-1552-68; AF Proj. 9783)
(AD-749553; UTIAS-181; AFOSR-72-1119TR) Avail: NTIS CSCL 07/4

A theoretical and experimental study of the initial ionization phase of an ionizing helium shock wave has been accomplished. Ionization relaxation time and the electron density profile behind the shock translational front, have been measured. Both of these parameters have strong dependence upon the atomic collisional excitation rate in the initial phase of the ionizing shock wave and therefore a comparison with theory led to an estimation of atom-atom collisional excitation cross-section. Theoretical predictions for the relaxation zone of the helium shock wave, indicated only a weak coupling between the electron and atom temperature during the relaxation process, contrary to the results found for hydrogen. A plasma focus driven shock tube was used to create the appropriate helium shock waves. Preliminary results were obtained using a Fray-Perot laser interferometer.
Author (GRA)

N73-13327# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
WATER TABLE SIMULATION OF SUBSONIC CHANNEL FLOW Technical Report, Jul. - Nov. 1971
Donald P. McErlean, Richard B. Rivir, Douglas C. Rabe, and William H. Heiser Jun. 1972 55 p refs
(AF Proj. 3145)
(AD-749134; AFAPL-TR-72-37) Avail: NTIS CSCL 20/5

The report presents the results obtained from a test program designed to simulate the flow of a compressible gas through a channel of varying cross section and wall contour through the use of the water analogy. All flows which were simulated had nominal values of free-stream Mach numbers between 0.1 and 0.6. Author (GRA)

N73-13328# Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.
APPLICATION OF PARAMETRIC TIME SERIES ANALYSIS METHODS TO DESCRIPTIONS OF WAVE-INDUCED FLUCTUATIONS IN THE ADJACENT AIRFLOW M.S. Thesis
Craig Howard Smith Sep. 1972 60 p refs
(AD-749045) Avail: NTIS CSCL 04/1

Certain methods of analysis for testing the hypothesis that organized motion exists in the airflow above naturally occurring water waves are examined. In particular, two current methods, spectral analysis and joint probability density function analysis, are briefly discussed; two new methods, matched filters and parametric time series analysis, are suggested. An analysis is done with parametric time series analysis on wind-wave data. The results show the tractability of this data to parametric methods, and the results are in agreement with previous spectral analyses of the data in the regions of overlap. Author (GRA)

N73-13329# Naval Postgraduate School, Monterey, Calif. Dept. of Physics.
BUBBLE DISTRIBUTIONS IN A QUIESCENT OCEAN

CALCULATED FROM THE BUBBLE TRANSPORT EQUATION M.S. Thesis
Thomas Carl Vajda Jun. 1972 52 p refs
(AD-749046) Avail: NTIS CSCL 20/4

A bubble transport equation was developed and a formal solution obtained for the bubble distribution function. The distribution function obtained depends upon the model used for bubble drag, gas diffusion, and ocean circulation. As a specific application, solutions were obtained for a one-dimensional, quiescent, steady state ocean with a bottom source at 197 meters. The characteristic equations were integrated numerically to test the accuracy of approximate analytical solutions. The calculated bubble densities were compared with experimental data available for this problem. When gas diffusion is neglected, the theoretical and experimental distributions are in general agreement. Author (GRA)

N73-13330# Naval Ordnance Lab., White Oak, Md.
CCAMIN: A COMPUTER PROGRAM FOR FITTING TIME OF ARRIVAL AND SHOCK PEAK OVER PRESSURE DATA IN A GAS
Edgar A. Cohen 4 Aug. 1972 48 p refs
(AD-749332; NOLTR-72-169) Avail: NTIS CSCL 20/4

CCAMIN is a FORTRAN package designed to fit time of arrival and shock peak overpressure versus slant range in a gas. The program allows one the option of either fitting both sets of data simultaneously or separately, and it allows for arbitrary nonlinear or linear regression forms. A listing of the program and sample cases as run on NOL's CDC 6400 are included. Author (GRA)

N73-13331# Lockheed Missiles and Space Co., Sunnyvale, Calif.
EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF TEMPERATURE SENSITIVE PAINTS Final Report, May 1971 - Mar. 1972
Howard D. Schultz Wright-Patterson AFB, Ohio AFFDL Jun. 1972 106 p refs
(Contract F33615-71-C-1635; AF Proj. 1366)
(AD-749582; AFFDL-TR-72-52) Avail: NTIS CSCL 20/4

The report presents the results of a study which consisted to two principal phases: An analytical investigation to extend the validity of the temperature-sensitive coating technique for aerodynamic heating measurement to areas in which known theories do not apply; and a combined analytical and experimental study to develop methods of predicting areas of high thermal gradients in an interfering flow field. Two data reduction computer programs were developed to treat the general two-dimensional case of a finite-slab convectively heated on one or both sides. These programs provide an inverse solution to the two-dimensional transient heat conduction equation with surface heating gradients and variable thermal properties. A three-dimensional shock interference wind tunnel model was designed fabricated and tested. By use of the temperature-sensitive coating technique, heating distributions in the interaction region have been identified in greater detail than is possible by use of thermocouple-instrumented models. GRA

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N73-13332 Michigan Univ., Ann Arbor.
INFRARED RADIANT TEMPERATURES IN THE ALPINE/PERIGLACIAL ENVIRONMENT AS RELATED TO THERMAL REMOTE SENSING Ph.D. Thesis
Ray Leonard Lougeay 1971 124 p
Avail: Univ. Microfilms Order No. 72-4925

Observations were conducted in the St. Elias Mountains, Yukon Territory, Canada to determine some aspects of the applicability of thermal remote sensing in the alpine/periglacial environment. Techniques of ground truth observations were tested by which a researcher might determine the usefulness of infrared scanning to his study without the financial investment of airborne remote sensing on a trial-and-error basis. Also, an attempt was made to determine the environmental controls upon radiant temperature by monitoring changing patterns of radiant temperature relative to changing meteorologic conditions. Observations of both actual and thermal infrared radiant temperatures were made over various environmental surfaces in the alpine/periglacial environment. The techniques developed proved useful in predicting the best time for thermal remote sensing overflight and in indicating the intensity of ground truth observations needed at that time. Dissert. Abstr.

N73-13333*# Geological Survey, Denver, Colo.
A STUDY OF QUATERNARY LANDFORMS AND MATERIALS IN THE MIDWEST AND GREAT PLAINS Progress Report, 1 Sep. - 31 Oct. 1972
Roger B. Morrison and George R. Hallberg, Principal Investigators (Iowa Geol. Survey) 1 Nov. 1972 11 p
(NASA Order S-70243-AG-1)
(E72-10272; NASA-CR-129234) Avail: NTIS HC $3.00 CSCL 08M

The author has identified the following significant results. Measurements made from prints of ERTS-1, MSS 5 images, show practical limits of detectability for this imagery in the Midwest. The smallest high contrast object detectable has an approximate measured diameter of 150 feet. The smallest clearly identifiable cultural feature is roughly 300 feet for high contrast, and 400 to 500 feet for low contrast objects. Rural roadways, with an average width of 75 feet, are clearly defined due to high reflectivity, linearity, and the instantaneous field of view of the scanner. On the infrared a farm pond slightly greater than one acre is detectable. Crop and natural foliage cover in the Midwest during summar months obscures geologic and soils information and hinders detailed mapping. In the western Great Plains large-scale mapping of this kind may be possible, even at this time of year. In southwestern Iowa, topographic and drainage system anomalies, revealed by the imagery, are related to the slope of and depth to the buried bedrock surface. In eastern Iowa land use classification can be done from ERTS-1 imagery.

N73-13334*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
DETERMINE UTILITY OF ERTS-1 TO DETECT AND MONITOR AREA STRIP MINING AND RECLAMATION Interim Report, May - Oct. 1972
Philip E. Chase, Principal Investigator Nov. 1972 9 p
(Contract NAS5-21762)
(E72-10284; NASA-CR-129273; BSR-3489) Avail: NTIS HC $3.00 CSCL 08I

There are no author-identified significant results in this report. Analysis of the strip mine records and aerial photos in the test site (five counties in southeastern Ohio) indicate rapidly increasing stripping in the past few years. The mines are large enough to be detected and their gross characteristics observed in the ERTS-1 imagery. Progress in adapting the Bendix ground station to handling ERTS-1 computer compatible tapes is described.

N73-13335*# California Univ., Riverside. Dept. of Plant Science.
EVALUATION OF REMOTE SENSING IN CONTROL OF PINK COTTON BOLLWORM Semiannual Report, Jul. - Nov. 1972
Lowell N. Lewis, Principal Investigator and Virginia B. Coleman 13 Dec. 1972 19 p ref
(Contract NAS5-21771)
(E72-10285; NASA-CR-129274; Rept-1) Avail: NTIS HC $3.00 CSCL 02B

The author has identified the following significant results. This investigation is attempting to evaluate the use of a satellite in monitoring the cotton production regulation program of the State of California as an aid in controlling pink bollworm infestation in the southern deserts of California. Color combined images of ERTS-1 multispectral images simulating color infrared are being used in crop identification. The status of each field is mapped from the imagery and is then compared to ground surveys taken at the time of each ERTS-1 overflight. Correlation has been to date 100%. A computer analysis will be performed to compare field status with the crop calendar in order to identify crops. Correlation is expected to be 80 to 90%. Cotton fields,

because of their state regulated season which is exactly coincident with no other crop, are expected to be easily identified.

N73-13336*# Institut Francais du Petrole, Paris (France).
STUDY GEOMORPHOLOGY, PAST AND PRESENT, LINEAR TRENCH, TECTONICS RELATIONSHIP BETWEEN PYRENEES AND ALPS Progress Report, Jul. - Nov. 1972
Jacques Guillemot, Principal Investigator Nov. 1972 6 p Sponsored by NASA
(E72-10286; NASA-CR-129275; SR-009.03) Avail: NTIS HC $3.00 CSCL 08E

There are no author-identified significant results in this report.

N73-13337*# Arizona Univ., Tucson. Dept. of Watershed Management.
USE OF EARTH RESOURCES TECHNOLOGICAL SATELLITE (ERTS) DATA IN A NATURAL RESOURCE INVENTORY Progress Report, 1 Oct. - 30 Nov. 1972
Ernest B. Fish, Principal Investigator 7 Dec. 1972 2 p (Contract NAS5-21820)
(E72-10287; NASA-CR-129277) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N73-13338*# Maine Dept. of Transportation, Augusta.
DETECTION AND MONITORING OF VEGETATION DAMAGE ASSOCIATED WITH HIGHWAYS AND HIGHWAY FACILITIES Interim Report, May - Nov. 1972
Ernest G. Stoeckeler, Principal Investigator Nov. 1972 6 p (Contract NAS5-21724)
(E72-10288; NASA-CR-129278) Avail: NTIS HC $3.00 CSCL 13B

There are no author-identified significant results in this report.

N73-13339*# Institut Francais du Petrole, Paris (France).
DYNAMIC BEHAVIOR OF COASTAL SEDIMENTATION IN THE LIONS GULF Progress Report, Jul. - Nov. 1972
Max Guy, Principal Investigator Dec. 1972 12 p Sponsored by NASA
(E72-10289; NASA-CR-129279; GOLION-1/1) Avail: NTIS HC $3.00 CSCL 08C

The author has identified the following significant results. The most important result is that MSS 6 and 7 very clearly shows the former shorelines of the Rhone Delta and enable them to be mapped directly. Another result is the change in shape of the Var mouth discharge with changing meteorological conditions. If good photographs of the western part of the Gulf of Lions are available in the future, the GOLION project will be performed as planned.

N73-13340*# American Univ., Washington, D.C. Dept. of Biology.
WETLANDS ECOLOGY Progress Report, Jun. - Oct. 1972
Richard R. Anderson, Principal Investigator, Virginia Carter, and John W. McGinness, Jr. Nov. 1972 11 p (Contract NAS5-21752)
(E72-10290; NASA-CR-129280) Avail: NTIS HC $3.00 CSCL 08H

The author has identified the following significant results. The ERTS imagery analyzed provides approximately 2/3 coverage of the test site. Analysis was made using visual methods, density slicing, and multispectral analysis. Preliminary conclusions reached are that most, if not all, of the investigation objectives can be met. Saline and near-saline wetlands can be delineated from ERTS-1 images as the wetland-upland boundaries and land-water interface are clearly defined. Major plant species or communities such as Spartina alterniflora (high and low vigor forms), Spartina patens/Distichlis spicata, and Juncus roemarianus can be discriminated and spoil disposal areas indentified.

N73-13341*# New York State Museum and Science Service, Albany.
GEOLOGICAL FEATURES AND SPECTRAL ANOMALIES IN SATELLITE IMAGERY OF THE ADIRONDACK MOUNTAIN RANGE
Yngvar W. Isachsen, Principal Investigator 12 Dec. 1972 1 p (Contract NAS5-21764)
(E72-10291; NASA-CR-129281) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N73-13342*# International Business Machines Corp., Gaithersburg, Md.
ALL DIGITAL PRECISION PROCESSING OF ERTS IMAGES Progress Report, period ending 30 Nov. 1972
Ralph Bernstein, Principal Investigator 8 Dec. 1972 4 p (Contract NAS5-21716)
(E72-10292; NASA-CR-129303) Avail: NTIS HC $3.00 CSCL 09B

There are no author-identified significant results in this report.

N73-13343*# Bureau of Sport Fisheries and Wildlife, Washington, D.C.
AN EVALUATION OF SPACE ACQUIRED DATA AS A TOOL FOR MANAGEMENT OF WILDLIFE HABITAT IN THE STATE OF ALASKA Progress Report, 1 Sep. - 31 Oct. 1972
Billy J. VanTries, Principal Investigator 1 Nov. 1972 3 p (NASA Order S-70243-AG-1)
(E72-10293; NASA-CR-129285) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N73-13344*# Geological Survey, Washington, D.C.
IRON-ABSORPTION BAND ANALYSIS FOR THE DISCRIMINATION OF IRON-RICH ZONES Progress Report, 1 Sep. - 31 Oct. 1972
Lawrence C. Rowan, Principal Investigator 1 Nov. 1972 4 p (NASA Order S-70243-AG-4)
(E72-10294; NASA-CR-129286) Avail: NTIS HC $3.00 CSCL 08G

The author has identified the following significant results. Analysis of ERTS-1 images of Nevada has followed two courses: comparative lineament mapping and spectral reflectance evaluation. The comparative lineament mapping was conducted by mapping lineaments on 9 x 9 inch prints of MSS bands 5 and 7, transferring the data to a base map, and comparing the results with existing geologic maps. The most significant results are that lineaments are more numerous on the band 7 images, and approximately 100 percent more were mapped than appear on existing maps. Geologic significance of these newly mapped lineaments will not be known until they are checked in the field: many are probably faults. Spectral analysis has been limited to visual comparison among the four MSS bands. In general, higher scene contrast is shown in the near infrared bands (6 and 7) than in the visible wavelength bands (4 and 5). The economic implications of these results derive chiefly from the greater efficiency that can be obtained by using near infrared as well as visible wavelength images.

N73-13345*# Geological Survey, Washington, D.C.
STUDY OF MULTISPECTRAL DATA, ERTS-A, NORTHWEST SAUDI ARABIA Progress Report, 1 Sep. - 30 Oct. 1972
Alfred J. Bodenlos, Principal Investigator 1 Nov. 1972 2 p (NASA Order S-70243-AG)
(E72-10295; NASA-CR-129287) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N73-13346*# Geological Survey, Menlo Park, Calif.
IDENTIFICATION OF GEOSTRUCTURES OF CONTINENTAL CRUST PARTICULARLY AS THEY RELATE TO MINERAL RESOURCE EVALUATION Progress Report, 1 Sep. - 31 Oct. 1972
George Gryc, Principal Investigator and Ernest H. Lathram 20 Nov. 1972 6 p refs (NASA Order S-70243-AG-1)
(E72-10296; NASA-CR-129288) Avail: NTIS HC $3.00 CSCL 08G

The author has identified the following significant results. Preliminary examination of ERTS-1 imagery in central and northern Alaska substantiates the existence of a conjugate set of northeast and northwest faults suggested by linears noted on Nimbus 4 images. Linears of both trends are well expressed and several have been mapped as faults, including the Shaw Creek fault. Imagery provides new data to support the interpretation that the Kobuk Trench is the northern margin of a broad west-trending

fault zone bounded on the north and south by strike-slip faults. In northwestern Alaska, MSS band 5 imagery shows Mississippian limestone as white, while shale, sandstone, and chert of other ages appear dark. As the limestone is the basal formation of the numerous thrust plates stacked in the area, images of band 5 will assist significantly in depicting the distribution of the thrust plates. In south-central Alaska the newly described Totshunda fault is readily identified and extends into areas not yet mapped. Also shown is another fault parallel to the south of the Totshunda which has not yet been recognized in the field.

N73-13347*# Helsinki Univ. (Finland). Dept. of Geology.
MAJOR CRUSTAL FRACTURES IN THE BALTIC SHIELD Progress Report
Heikki V. Tuominen, Principal Investigator 12 Dec. 1972 7 p Sponsored by NASA
(E72-10297; NASA-CR-129289; PR-1) Avail: NTIS HC $3.00 CSCL 08E

The author has identified the following significant results. Initial analysis of the bands for images 1039-09322, 1039-09315, and 1040-09371 provide a detailed picture of a zone extending 500 km north-northeast from the northern coast of the Gulf of Bothnia. Highways (on bands 0.5-0.6 and 0.6-0.7), rivers (bands 0.7-0.8, 0.8-1.1) and bare fell tops are visible. Schist belts, as known from ground surveys, can be discerned from areas occupied by their basement rocks or major plutons. A number of sharp lineaments, apparently faults, are visible. Some major fracture zones, up to 50 km wide, that form distinct lineaments in weather satellite pictures and belong to the main objects of this study, are rather indistinct in the images but can be traced.

N73-13348*# National Research Council, Bangkok (Thailand).
THE THAILAND PROGRAMME OF EARTH RESOURCES TECHNOLOGY SATELLITE Progress Report
Pradisth Cheosakul, Principal Investigator 18 Dec. 1972 3 p Sponsored by NASA
(E72-10298; NASA-CR-129544) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Multispectral scanner image quality is considered excellent. It is immediately apparent that details of the coastline, water courses, and many other features readily apparent in the imagery will permit important updating and correction of available maps of Thailand.

N73-13349*# Wisconsin Univ., Madison.
INTERDISCIPLINARY RESEARCH ON THE APPLICATION OF ERTS-1 DATA TO THE REGIONAL LAND USE PLANNING PROCESS
James L. Clapp, Principal Investigator, R. W. Kiefer, M. M. McCarthy, and B. J. Niemann, Jr. 4 Oct. 1972 35 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21754)
(E72-10299; NASA-CR-129548) Avail: NTIS HC $3.75 CSCL 08G

The author has identified the following significant results. Although the degree to which ERTS-1 imagery can satisfy regional land use planning data needs is not yet known, it appears to offer means by which the data acquisition process can be immeasurably improved. The initial experiences of an interdisciplinary group attempting to formulate ways of analyzing the effectiveness of ERTS-1 imagery as a base for environmental monitoring and the resolution of regional land allocation problems are documented. Application of imagery to the regional planning process consists of utilizing representative geographical regions within the state of Wisconsin. Because of the need to describe and depict regional resource complexity in an interrelatable state, certain resources within the geographical regions have been inventoried and stored in a two-dimensional computer-based map form. Computer oriented processes were developed to provide for the economical storage, analysis, and spatial display of natural and cultural data for regional land use planning purposes. The authors are optimistic that the imagery will provide revelant data for land use decision making at regional levels.

N73-13350*# Maine Dept. of Transportation, Augusta. Bureau of Highways.
MAP THE DISTRIBUTION OF GLACIOFLUVIAL DEPOSITS AND ASSOCIATED GLACIAL LANDFORMS Interim Report, May - Nov. 1972
Raymond G. Woodman and Ernest G. Stoeckeler, Principal Investigators 30 Nov. 1972 9 p refs
(Contracts NAS5-21747; NAS5-21772)
(E72-10300; NASA-CR-129549; Rept-1) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Relatively little good usable ERTS-1 imagery has been received to date for data extraction. Of three U-2 aircraft support missions flown in Maine, only photography from the 20 September flight is cloud free and of excellent quality. Controlled local contract photography flown in August and September is of generally excellent quality. Low altitude ground truth photography is useful. The system of image and photo filing is discussed, and the limited work involving image and photo comparison is described.

N73-13351*# Natural Resources Management Corp., Berkeley, Calif. Research and Development Div.
INVESTIGATION OF THE DETECTION AND MONITORING OF FOREST INSECT INFESTATIONS IN THE SIERRA NEVADA MOUNTAINS OF CALIFORNIA Progress Report, 20 Jun. - 30 Nov. 1972
Ralph C. Hall, Principal Investigator 30 Nov. 1972 10 p
(Contract NAS5-21770)
(E72-10301; NASA-CR-129550) Avail: NTIS HC $3.00 CSCL 02F

The author has identified the following significant results. Due to the fact that all of the ERTS-1 imagery has not been received, evaluation of this imagery will be delayed until all of it is at hand. It has been determined that the arbitrary classification of tree mortality into dead, dying, and light damage is sound in that each class is significatly different in terms of number and volume of trees killed. It has likewise been determined that the different classes of defoliation of light, medium, and heavy are significantly different in terms of the needles per tip. It has been found that all classes of tree mortality and degrees of defoliation are readily and accurately identified from underflight photos in color and color IR in both scales of 1/5000 and 1/18,500. Evaluation of U-2 imagery is incomplete. It has been determined, however, that through the use of RC-10 color IR it is expected to be able to detect all three classes of tree mortality and probably at least two extreme levels of defoliation.

N73-13352*# Centre National de la Recherche Scientifique, Toulouse (France). Service de la Carte de la Vegetation.
MANAGEMENT OF NATURAL RESOURCES THROUGH AUTOMATIC CARTOGRAPHIC INVENTORY Progress Report, Aug. - Sep. 1972
Paul-Augustin Rey, Principal Investigator, Yves Gourinard, and Francis Cambou Nov. 1972 26 p Sponsored by NASA
(E72-10303; NASA-CR-129552; PR-1) Avail: NTIS HC $3.50 CSCL 08B

The author has identified the following significant results. Return beam vidicon and multispectral band scanner imagery will be correlated with existing veg .tation and geologic maps of southern France and northern Spain to develop correspondence codes between map units and space data. Microclimate data from six stations, spectral measurements from a few meters to 2 km using ERTS-type filter and spectrometers, and leaf reflectance measurements will be obtained to assist in correlation studies.

N73-13353*# North American Rockwell Corp., Thousand Oaks, Calif. Science Center.
EARTHQUAKE EPICENTERS AND FAULT INTERSECTIONS IN CENTRAL AND SOUTHERN CALIFORNIA Progress Report, Jun. - Nov. 1972
Monem Abdel-Gawad, Principal Investigator and Joel Silverstein Dec. 1972 93 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21767)
(E72-10304; NASA-CR-129553; SC691-3PR) Avail: NTIS HC $6.75 CSCL 08K

The author has identifed the following significant results. ERTS-1 imagery provided evidence for the existence of short transverse fault segments lodged between faults of the San Andreas system in the Coast Ranges, California. They indicate that an early episode of transverse shear has affected the Coast Ranges prior to the establishment of the present San Andreas fault. The fault has been offset by transverse faults of the Transverse Ranges. It appears feasible to identify from ERTS-1 imagery geomorphic criteria of recent fault movements. Plots of historic earthquakes in the Coast Ranges and western Transverse Ranges show clusters in areas where structures are complicated by interaction of tow active fault systems. A fault lineament apparently not previously mapped was identified in the Uinta Mountains, Utah. Part of the lineament show evidence of recent faulting which corresponds to a moderate earthquake cluster.

N73-13354*# Kansas Univ., Lawrence. Space Technology Labs.
KANSAS ENVIRONMENTAL AND RESOURCE STUDY: A GREAT PLAINS MODEL, TASKS 1-6 Progress Report, period ending 30 Nov. 1972
Robert M. Haralick, Edward T. Kanemasu, Stanley A. Morain, Harold L. Yarger, Principal Investigators, Fawwaz T. Ulaby, K. Sam Shanmugam, Donald L. Williams, James R. McCauley, and James L. McNaughton 30 Nov. 1972 77 p
(Contract NAS5-21822)
(E72-10305; NASA-CR-129554) Avail: NTIS HC $6.00 CSCL 08F

There are no author identified significant results in this report. Environmental and resources investigations in Kansas utilizing ERTS-1 imagery are summarized for the following areas: (1) use of feature extraction techniqued for texture context information in ERTS imagery; (2) interpretation and automatic image enhancement; (3) water use, production, and disease detection and predictions for wheat; (4) ERTS-1 agricultural statistics; (5) monitoring fresh water resources; and (6) ground pattern analysis in the Great Plains. A.L.

N73-13355*# Purdue Univ., Lafayette, Ind.
AUTOMATIC MAPPING OF GEOLOGICAL FEATURES FROM ERTS-1 MSS DATA OBTAINED OVER FANNIN COUNTY, TEXAS
Marion F. Baumgardner, D. A. Landgrebe, Principal Investigators, and H. H. Kramer 4 Dec. 1972 1 p
(Contract NAS5-21785)
(E72-10306; NASA-CR-129555) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N73-13356*# Purdue Univ., Lafayette, Ind.
AUTOMATIC IDENTIFICATION OF LAND USES FROM ERTS-1 DATA OBTAINED OVER MILWAUKEE, WISCONSIN
Marion F. Baumgardner, D. A. Landgrebe, Principal Investigators, and H. H. Kramer 8 Dec. 1972 2 p
(Contract NAS5-21785)
(E72-10307; NASA-CR-129556) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Spectrally, thirteen classes of ground cover were identified within Milwaukee County: five classes of water, grassy open areas, beach, two classes of road, woods, suburban, inner city, and industry. A distinct concentric pattern of land use was identified in the county radiating outward from the central business district. The first ring has a principal feature, termed the inner city, which is indicative of the older part of the county. In the second ring, the land use becomes more complex, consisting of suburban areas, parks, and varied institutional features. The third general ring consists primarily of open, grassy land, with scattered residential subdivisions, wood lots, and small water bodies. The five classes of water identified suggest differences in depth, turbidity, and/or color. A number of major roads were identified. Other spectrally identifiable features included the larger county parks and larger cemeteries.

N73-13357*# Maine State Highway Dept., Bangor.
TO DEVELOP A LAND USE-PEAK RUNOFF CLASSIFICATION SYSTEM FOR HIGHWAY ENGINEERING PURPOSES Progress Report
Ernest G. Stoeckeler, Principal Investigator 1 Dec. 1972 1 p
(Contract NAS5-21772)
(E72-10308; NASA-CR-129557; PR-3) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N73-13358*# Army Construction Engineering Research Lab., Champaign, Ill.
EFFECTS OF CONSTRUCTION AND STAGED FILLING OF RESERVOIRS ON THE ENVIRONMENT AND ECOLOGY Progress Report, 8 Jun. - 8 Dec. 1972
R. K. Jain, Principal Investigator 7 Dec. 1972 4 p
(NASA Order S-70255-AG)
(E72-10309; NASA-CR-129558) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N73-13359*# Iowa Univ., Iowa City.
UTILIZING ERTS-A IMAGERY FOR TECTONIC ANALYSIS THROUGH STUDY OF BIGHORN MOUNTAINS REGION Progress Report
Richard A. Hoppin, Principal Investigator 15 Nov. 1972 5 p
(Contract NAS5-21852)
(E72-10310; NASA-CR-129559) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N73-13360*# Direccion de Cartografia Nacional, Caracas (Venezuela).
DEVELOPMENT OF TECHNIQUES TO SIMPLIFY THE PROCESS OF INVESTIGATION AND ESTIMATE OF NATURAL RESOURCES IN REMOTE AND RELATIVELY UNEXPLORED AREAS Preliminary Report, Apr. 1971 - Jun. 1972
Adolfo C. Romero, Principal Investigator Sep. 1972 15 p
Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(E72-10311; NASA-CR-129560) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N73-13361*# Mississippi State Univ., State College. Inst. for Environmental Studies
APPLICATION OF ERTS-A DATA TO AGRICULTURAL PRACTICES IN THE MISSISSIPPI DELTA REGION Progress Report, period ending 30 Nov. 1972
C. W. Bouchillon, Principal Investigator 8 Dec. 1972 5 p
(Contract NAS5-21881)
(E72-10312; NASA-CR-129561) Avail: NTIS HC $3.00 CSCL 02C

There are no author-identified significant results in this report.

N73-13362*# Michigan State Univ., East Lansing.
USE OF ERTS DATA FOR A MULTIDISCIPLINARY ANALYSIS OF MICHIGAN RESOURCES Status Report
Axel L. Anderson, Principal Investigator, Wayne L. Myers, A. H. Ellingbroe, and E. P. Whiteside 1 Dec. 1972 9 p
(Contract NAS5-21834)
(E72-10313; NASA-CR-129562) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N73-13363*# Arizona Univ., Tucson.
A STUDY TO EXPLORE THE USE OF ORBITAL REMOTE SENSING TO DETERMINE NATIVE ARID PLANT DISTRIBUTION Progress Report, period ending 17 Dec. 1972
William G. McGinnies, Principal Investigator 17 Dec. 1972 2 p
(Contract NAS5-21812)
(E72-10314; NASA-CR-129563) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N73-13364*# Tennessee Univ., Knoxville. Dept. of Geography.
GEOGRAPHIC APPLICATIONS OF THE EARTH RESOURCES TECHNOLOGY SATELLITE (ERTS-1) TO LANDSCAPE CHANGE
John B. Rehder, Principal Investigator 22 Dec. 1972 2 p

Proposed for presentation at 1st Pan Am. Symp. on Remote Sensing, Panama, 27 Apr. - 2 May 1973
(Contract NAS5-21726)
(E72-10315; NASA-CR-129564) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N73-13365*# Corps of Engineers, San Francisco, Calif.
CALIFORNIA COAST NEARSHORE PROCESSES STUDY Progress Report, 1 Sep. - 31 Oct. 1972
Douglas M. Pirie, Principal Investigator 31 Oct. 1972 21 p Prepared in cooperation with North Am. Rockwell Corp., Downey, Calif.
(NASA Order S-70257-AG)
(E72-10316; NASA-CR-129565; ERTS-1-I-1) Avail: NTIS HC $3.25 CSCL 08C

There are no author-identified significant results in this report.

N73-13366*# North Carolina State Univ., Raleigh.
UTILIZATION OF ERTS-1 DATA IN NORTH CAROLINA Interim Report, May - Nov. 1972
Charles W. Welby, Principal Investigator, J. O. Lammi, and R. J. Carson Dec. 1972 8 p
(Contract NAS5-21732)
(E72-10317; NASA-CR-129575) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Initial study and interpretation of ERTS-1 imagery indicates its usefulness for regional land use planning purposes in North Carolina. Quarries, many secondary roads, and the existence of urbanization as well as changes in urban areas may be mapped. Differences in spectral response for various parts of the major cities suggests that the type of activity in urbanized areas may be monitored. Geological mapping at a scale of 1:250,000 may be possible. The major unfavorable comment from various organizations and agencies who are potential users has been to the relatively small scale. The imagery is a powerful illustrative tool for the several state agencies cooperating in the investigation.

N73-13367*# Arizona Univ., Tucson. Dept. of Biological Sciences.
DETERMINATION OF SPECIES Bimonthly Report
Charles H. Lowe, Principal Investigator and Dana M. Slaymaker 20 Dec. 1972 2 p
(Contract NAS5-21819)
(E72-10318; NASA-CR-129576; BMR-1) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N73-13368*# Tennessee Univ., Knoxville.
UTILIZATION OF ERTS DATA TO DETECT PLANT DISEASES AND NUTRIENT DEFICIENCIES, SOIL TYPES AND MOISTURE LEVELS Progress Report
W. L. Parks, J. I. Sewell, Principal Investigators, J. W. Hilty, and J. C. Rennie 27 Dec. 1972 4 p
(Contract NAS5-21873)
(E72-10320; NASA-CR-129578; PR-1) Avail: NTIS HC $3.00 CSCL 08M

The author has identified the following significant results. A significant finding is the identification and delineation of a large soil association in Obion County, West Tennessee. These data are now being processed through the scanner and computer and will be included in the next report along with pictures of printout and imagery. Channel 7 appears to provide the most useful imagery related to soil differences. Soil types have been identified through the use of aircraft imagery. However, a soil association map appears to be the best that space imagery will provide. The exception to this will be large areas of a uniform soil type as occurs in the great plains.

N73-13369*# Oceanographic Services, Inc., Santa Barbara, Calif.
ACQUISITION AND ANALYSIS OF COASTAL GROUND-TRUTH DATA FOR CORRELATION WITH ERTS-A IMAGERY Bimonthly Progress Report, 2 Oct. - 2 Dec. 1972
Richard C. Miller, Principal Investigator 21 Dec. 1972 2 p
(Contract NAS5-21877)
(E72-10321; NASA-CR-129579; BMPR-1) Avail: NTIS HC $3.00 CSCL 08J

The author has identified the following significant results. Areas with high sediment loads and a wide range of water parameters (such as San Francisco Bay, an area not a target of this study but included in the imagery) show dramatic variations in the photographs. Open oceanic areas off California have relatively homogenous water and hence a much lower range of contrast. The mean shore coastal areas show an intermediate range.

N73-13370*# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
THE USE OF ERTS-1 IMAGERY IN THE NATIONAL PROGRAM FOR THE INSPECTION OF DAMS
Duwayne M. Anderson, Principal Investigator 20 Dec. 1972 1 p Proposed for presentation at Remote Sensing of Water Resources Intern. Symp., Burlington, Ontario, 11-14 Jun. 1973
(NASA Order S-70253-AG)
(E72-10322; NASA-CR-129580) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N73-13371# Finnish Meteorological Inst., Helsinki.
LIGHTNING FLASH COUNTER MEASUREMENTS IN FINLAND DURING 1971
Leila Laitinen 1972 17 p refs In FINNISH; ENGLISH summary
(Rept-41; ISBN-951-697-007-9) Avail: NTIS HC $3.00

Lightning flashes were counted by 61 instruments at 60 stations, with reliable results being obtained from 58 stations. Data on the number of flashes, strokes per 100 sq km, number of days with at least 5 registrations, and mean stroke values per station are tabulated. In May and June 1971 there was more than a normal amount of thunderstorms. In July the number of lightning flashes was less than normal. In August the number of thunderstorms was well over the normal value, and in September there were no strong thunderstorms. The distribution of the total number of registrations for 1971 is given and is similar to the distribution of the previous decade. Author

N73-13372# Joint Publications Research Service, Arlington, Va.
IONOSPHERIC RESEARCH IN THE USSR
10 Nov. 1972 23 p refs Transl. into ENGLISH from Ionosfernyye Issled. (Moscow), no. 20, 1972
(JPRS-57474) Avail: NTIS HC $3.25

The results of a study of the ionosphere by noncoherent scattering of radio waves, and the research conducted during the international quiet sun year are reported. For individual titles, see N73-13373 through N73-13374.

N73-13373 Joint Publications Research Service, Arlington, Va.
POSSIBILITIES AND CERTAIN RESULTS OF THE STUDY OF THE IONOSPHERE BY THE METHOD OF 'NONCOHERENT' SCATTERING OF RADIO WAVES
V. A. Misyura, G. N. Tkachev, Yu. G. Yerokhin, V. I. Ivanov, N. I. Nisnevich, N. M. Borodin, and V. Ya. Bludov *In its* Ionospheric Res. in the USSR Nov. 1972 p 85-93 refs (For availability see N73-13372 04-13)

The determination of the ionospheric ion composition was studied using high-potential radar sets with storage elements for detecting and measuring noncoherent scattered radio signals. Disregarding collisions for backscattering, the equations for electron concentration are developed for typical cases, and the parameters of radar sets for ionospheric measurements of noncoherent scattering are tabulated. Vertical profiles of electron concentrations are included. F.O.S.

N73-13374 Joint Publications Research Service, Arlington, Va.
IONOSPHERE RESEARCH IN THE USSR DURING THE INTERNATIONAL QUIET SUN YEAR
N. P. Benkova, Yu. V. Kushnerevskiy, N. V. Mednikova, M. D. Fligel, and B. S. Shapiro *In its* Ionospheric Res. in the USSR Nov. 1972 p 181-184 refs (For availability see N73-13372 04-13)

The vertical soundings are reported which were conducted for reference stations, middle latitude stations, and high-latitude stations. Tabulated data include: station, geographic coordinates, type of ionosonde, and type of observation. F.O.S.

N73-13375*# California Univ., Los Angeles. Plasma Physics Group.
CAN THE IONOSPHERE REGULATE MAGNETOSPHERIC CONVECTION?
F. V. Coroniti and C. F. Kennel Oct. 1972 41 p refs Submitted for publication
(Grants NGR-05-007-190; NSF GA-34148)
(NASA-CR-130124; PPG-128) Avail: NTIS HC $4.25 CSCL 04A

Following a southward shift of the interplanetary magnetic field, which implies enhanced reconnection at the nose of the magnetosphere, the magnetopause shrinks from its Chapman-Ferraro equilibrium position. If the convective return of magnetic flux to the magnetopause equalled the reconnection rate, the magnetopause would not shrink. Consequently, there is a delay in the development of magnetospheric convection following the onset of reconnection, which is ascribed to line tying by the polar cusp ionosphere. A simple model relates the dayside magnetopause displacement to the currents feeding the polar cap ionosphere, from which the ionospheric electric field, and consequently, the flux return rate, may be estimated as a function of magnetopause displacement. Flux conservation arguments then permit an estimate of the time scale on which convection increases, which is not inconsistent with that of the substorm growth phase. Author

N73-13376*# Michigan Univ., Ann Arbor. Space Physics Research Lab.
OGO-F-02 DATA ANALYSIS Final Report
A. F. Nagy, W. M. Silvis, and E. C. Foust Nov. 1972 37 p refs
(Contract NAS5-9306; ORA Proj. 078900)
(NASA-CR-130128) Avail: NTIS HC $4.00 CSCL 04A

The OGO-VI satellite, which was launched on June 5, 1969 carried a complement of twenty-six experiments. One of those instruments, the F-02 package, was a cylindrical Langmuir probe experiment whose primary purpose was to measure ionospheric electron temperatures and densities. This report briefly describes the F-02 experiment itself, outlines the computer programs developed to analyze the raw data, and gives a summary of the scientific information obtained, with the aid of this experiment. Author

N73-13377# Lockheed Missiles and Space Co., Palo Alto, Calif.
EQUATORIAL CURRENT JET FROM MEASUREMENTS ON THE KOSMOS-321
Sh. Sh. Dolginov 1972 10 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 12, no. 4, 1972 p 699-706
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616 CSCL 04A

Equatorial electrojet measurements made by Cosmos 321 and at magnetic observatories are compared. The depths of the nonconductive layer of the earth are determined within the scope of the McNish-Chapman induction model. Author

N73-13378*# Wisconsin Univ. Madison. Inst. for Environmental Studies.
ON MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS Progress Report, 1971 - 1972
1972 86 p refs
(Grant NGL-50-002-127)
(NASA-CR-129797) Avail: NTIS HC $6.50 CSCL 08H

This research is directed toward development of a practical, operational remote sensing water quality monitoring system. To accomplish this, five fundamental aspects of the problem have been under investigation during the past three years. These are: (1) development of practical and economical methods of obtaining, handling and analyzing remote sensing data; (2) determination of the correlation between remote sensed imagery and actual water quality parameters; (3) determination of the optimum technique for monitoring specific water pollution parameters and for evaluating the reliability with which this can be accomplished; (4) determination of the extent of masking due to depth of penetration, bottom effects, film development effects, and angle falloff, and development of techniques to eliminate or minimize them; and (5) development of operational procedures which might be employed by a municipal, state or federal agency for the application of remote sensing to water quality monitoring, including space-generated data. Author

N73-13379# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AN AUTOMATIC SYSTEM FOR THE PREPARATION AND CONTINUATION OF TOPOGRAPHIC MAPS [EIN AUTOMATIONSSYSTEM FUER DIE HERSTELLUNG UND FORTFUEHRUNG TOPOGRAPHISCHER KARTEN]
Herbert Knorr 1972 28 p refs In GERMAN; ENGLISH summary
(Mitt-130) Avail: NTIS HC $3.50

The preparation and revision of topographic maps for electronic data processing is studied. As to data acquisition, the procedures are distinguished by survey maps and derived maps. The instruments for digitizing, data output, data processing, and data recording are described which are available for this task. A selection of the tests which so far have been performed at the institute for Applied Geodesy is presented. Author

N73-13380# Ionospharen-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING: FREIBURG URSI-CODE 131, AUGUST 1972 [IONOSPHAEREN-DATEN, VERTIKAL-ECHO, LOTUNG: FREIBURG, URSI-CODE 131, AUGUST 1972]
Aug. 1972 44 p In ENGLISH and GERMAN
(Rept-314-F) Avail: NTIS HC $4.25

Daily summaries are presented for vertical echo sounding of the upper atmosphere during August 1972. The data include charts of median values for the E and F regions. Author

N73-13381# Ionospharen-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING: FREIBURG, URSI-CODE 131, SEPTEMBER 1972 [IONOSPHAEREN-DATEN, VERTIKAL-ECHO-LOTUNG: FREIBURG, URSI-CODE 131, SEPTEMBER 1972]
Sep. 1972 44 p In ENGLISH and GERMAN
(Rept-315-F) Avail: NTIS HC $4.25

Daily summaries are presented for vertical echo sounding of the upper atmosphere during September 1972. The data include charts of median values for the E and F regions. Author

N73-13382# Lockheed Missiles and Space Co., Palo Alto, Calif.
DESCRIPTION OF EARTH'S PRINCIPAL MAGNETIC FIELD
L. O. Tiurmina 1972 12 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 12, no. 4, 1972 p 676-687
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Several methods for analyzing and describing the earth's magnetic field are reported that use intrinsic and anomalous satellite observations as well as ground based and near earth magnetic measurements. Considered are advantages and error probabilities for: Graphical representation, dipole representation, and spherical harmonic series methods for component analyses and construction of declination maps. G.G.

N73-13383# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
EVOLUTION OF THE PHYSICAL PICTURE OF THE WORLD, 1
A. Akhiezer 1971 34 p ref In RUSSIAN; ENGLISH summary
(ITF-71-104-P) Avail: AEC Depository Libraries

A systematic review is given of the ideas that constitute the basis for the development of physics. The gnosiological problems bound up with the development of theoretical physics are discussed together with the physical ideas. The first part of the review is devoted to a discussion of the principles of classical mechanics, classical electrodynamics and relativity theory. The second part presents the foundations of quantum mechanics, including the problems of the theory of measurements, the principles and results of quantum electrodynamics and the general ideas of elementary particle physics. The review is concluded with the discussion of the relations between the theoretical physics and mathematics, as well as the connection of the theoretical physics with experimental one. Author (NSA)

N73-13384# Weapons Research Establishment, Salisbury (Australia).
IONOSPHERIC TILTS IN THE F REGION IN THE ABSENCE OF SPREAD F NEAR THE MAGNETIC EQUATOR
R. F. Treharne May 1971 18 p refs
(WRE-TN-A-199(AP)) Avail: AEC Depository Libraries

Observations of the Bramley and Ross type of the ionospheric tilt were made near the magnetic equator. During daytime these observations are hindered by the presence of the intense irregularities in the E region, but these tilts do appear to the larger and to have a bias not seen in temperate latitudes; this bias reverses in direction at sunset. During the evening, if spread F is absent, the tilts of the F region may be observed clearly; these show tilts of much greater magnitude and bias, having a much slower time scale than temperate latitudes. An attempt is made to relate the evening tilts to the post sunset rise in the height of the F region that is observed elsewhere near the magnetic equator, but the only point of agreement is that the times of maximum tilt and of maximum height are coincident. The direction of maximum tilt varies from night to night. Author (NSA)

N73-13385# Massachusetts Inst. of Tech., Cambridge.
CLIMATOLOGY OF THE STRATOSPHERE FROM OBSERVATIONS
Reginald E. Newell 16 Feb. 1972 76 p refs Presented at Survey Conf., Cambridge, Mass., 15 Feb. 1972 Sponsored by AEC
(COO-2195-2; Conf-720210-2) Avail: NTIS

Diagnostic studies were made of the general circulation of the stratosphere, with the aim of understanding the momentum, energy, and mass budgets. Initially data from IGY-IGC were used and vertical motion was computed from the adiabatic approximation. It was found that the lower stratosphere at middle and high latitudes received its energy from the troposphere. The studies were extended to 60 km using the Meteorological Rocket Network data (though without vertical motion computations); even at these heights there is a large response to energy transmitted upwards through 30 km. Spring maxima in surface fallout, stratospheric ozone and sudden warming in the lower stratosphere were found to be related to modulations in the vertical energy flux. A numerical model was developed by Peng which reproduced the temperature increase with latitude in the lower stratosphere. Author

N73-13386# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
RADIATIVE HEATING OF THE GLOBAL ATMOSPHERE
Thomas Gilbert Dopplick [1971] 52 p refs
(Contract AT(30-1)-2241)
(COO-2195-4) Avail: NTIS

Monthly zonal mean global radiative heating rates have been obtained from the surface to 10 mb for all twelve months. Seasonal profiles of the contribution by each constituent are presented in addition to seasonal profiles of net thermal cooling and total radiative heating. Radiation cools the troposphere almost everywhere primarily due to thermal cooling by water vapor and the cooling is maximum in the tropics. The tropical stratosphere is heated by radiation due principally to thermal and solar heating by ozone. This total radiative heating extends into the stratospheric mid-latitudes but higher latitudes exhibit cooling due primarily to thermal cooling by carbon dioxide with the warmer hemisphere showing more cooling. Comparison with previous theory in the Northern Hemisphere shows qualitative agreement although the present study has more resolution because of the better specification of the radiative parameters, in particular, ozone and temperature. Author

N73-13387# Brookhaven National Lab., Upton, N.Y.
ATMOSPHERIC SULFUR AND ITS LINKS WITH THE BIOSPHERE
Frank B. Hill 1972 49 p refs Presented at Carbon and the Biosphere Conf., Upton, N. Y., 16 May 1972 Sponsored by AEC
(BNL-16906; Conf-720510-1) Avail: NTIS

The atmospheric sulfur cycle is reviewed with emphasis on its connections with the biosphere. Topics discussed concerning these connections are: biometeorological factors affecting rates of uptake of sulfur dioxide by vegetation, the use of regional atmospheric pollution models to predict acidity in precipitation, and factors affecting emission of biogenic sulfur compounds into the atmosphere. Author

N73-13388# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
PLANETARY TRANSPORT PROCESSES IN THE UPPER ATMOSPHERE Annual Progress Report
Reginald E. Newell 31 May 1972 16 p refs
(Contract AT(11-1)-2195)
(COO-2195-6) Avail: NTIS

Results of research on fundamental processes which govern the structure, mass, and momentum of the upper atmosphere are reported. Lists of publications, theses, reports, and papers associated with the research are included. NSA

N73-13389# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil). Lab. de Fisica Espacial.
GEOMAGNETIC MEASUREMENTS AT SAO JOSE DOS CAMPOS Final Report, Jul. 1967 - May 1970
Fernando DeMendonca Nov. 1971 87 p refs
(Grant AF-AFOSR-0654-67; AF Proj. 7601)
(AD-747060; LAFE-181; ACRL-72-0450) Avail: NTIS CSCL 08/14

The scalar value of the total intensity of the earth's magnetic field was recorded for portions of the intervals from July 1967 through May 1970. The values were recorded at Sao Jose Dos Campos, Brazil, a site located within the area where the total intensity is at a world-wide minimum value. The data obtained from an alkali vapor magnetometer, included the hourly mean of the total field per day, the daily mean, the range and an index based on the root mean square of the hourly deviations from the average field of the day. Author (GRA)

N73-13390# Banaras Hindu Univ., Varanasi (India).
NATURAL GENERATION OF ELECTROMAGNETIC WAVES AND INTERACTION WITH MEDIA Progress Report, 1 Sep. - 30 Nov. 1971
R. N. Singh Dec. 1971 33 p refs
(Contract EOOAR-70-0070; AF Proj. 5631)
(AD-747094; AFCRL-72-0443; PR-7) Avail: NTIS CSCL 04/1

The heating of the electron component of a magnetoplasma due to localized time varying magnetic field perturbations has been studied by solving the relevant Boltzmann transport equation. The variation in electron temperature with pitch angle in chosen plasma models has been studied. The change in electron temperature with perturbation time in each of the plasma models has been shown. It is argued that these results may be helpful in interpreting and analyzing some observed geophysical and astrophysical features. GRA

N73-13391# Banaras Hindu Univ., Varanasi (India).
ENERGIZATION OF ELECTRONS IN MAGNETOPLASMA BY WAVE PARTICLE INTERACTION
R. N. Singh Mar. 1972 148 p refs
(Contract EOOAR-70-0070; AF Proj. 5631)
(AD-747093; SR-4; AFCRL-72-0442) Avail: NTIS CSCL 04/1

The report studies the energization of electrons in a magnetoplasma by wave-particle interaction. Depending upon the refractive index of the plasma medium and the field parameters the wave particle interaction exhibits either synchronous or oscillatory behavior. Adopting dipole model of geomagnetic field and various plasma and field parameters the energization of electrons in the ionosphere and magnetosphere has been studied. Detailed computation of energy gain and time of energy oscillation has been carried out. An effort has been made to explain some of the ionospheric and magnetospheric phenomena in the light of these calculations. The role of effective electron collision frequency on the wave particle phenomena has been considered. The problem is reformulated to include the effect of finite collisions. Computation is carried out to display the effect of collisions. Author (GRA)

N73-13392# Naval Coastal Systems Lab., Panama City, Fla.
AN IMPROVED SEA BOTTOM CLASSIFIER
Bobby R. Ludlum Aug. 1972 25 p ref
(AD-748611; NCSL-115-72) Avail: NTIS CSCL 08/10

An improved sea bottom classifier device configured for use with a towed underwater vehicle is described. Operating on the same basic principles as earlier models, but including several refinements, the device provides a relative indication of sea bottom hardness. Some preliminary sea test results are given along with a detailed discussion of the circuits of the improved device. Author (GRA)

N73-13393# Alaska Univ., College. Geophysical Inst.
OBSERVATION OF VLF PHENOMENA INSIDE THE AURORAL ZONE Final Report, 1 Apr. 1968 - 31 May 1972
Daniel W. Swift and R. N. Strivastava Jun. 1972 88 p refs
(Contract DAHC04-69-C-0054; DA Proj. 2M0-61102-B-53-B)
(AD-748880; AROD-7942-3-EN) Avail: NTIS CSCL 04/1

The report presents the results of a three-year program of observations and analysis of very low frequency (VLF) radio emissions in the auroral zone. The particular VLF emissions which are the subject of the study are VLF hiss, VLF chorus and extra low frequency (ELF) hiss. All of these emissions occur in the audio frequency range, and the nomenclature of these various emissions is derived from the sounds generated when the undetected signal is fed into a loudspeaker. Author (GRA)

N73-13394# Rice Univ., Houston, Tex.
IONOSPHERIC HEATING ANALYSIS Interim Technical Report, 1 Dec. 1971 - 31 May 1972
William E. Gordon and Herbert C. Carlson Jul. 1972 30 p refs
(Contract F30602-72-C-0278; ARPA Order 1423)
(AD-748222; RADC-TR-72-208) Avail: NTIS CSCL 04/1

The high frequency radio heating of the ionosphere running from May 1-20 has produced some surprising observational evidence of enhancements associated with the extraordinary mode of the heating radiowave (previously all other enhancements have been excited by the ordinary mode), enhanced gyro lines, and of ionospheric holes burned by the heating transmitter. In the search for spectral features there has been discovered evidence for weak but measurable lines induced by the HF radio waves (O-mode) at the electron gyro-frequency and at twice the gyrofrequency. The ionospheric holes are seen as extra traces on the ionograms and can be checked against electron density profiles made with the heater on and off. The anomalous heating that produces large enhancements in the intensity of the plasma line continues to attract major attention. GRA

N73-13395# Washington Univ., Seattle. Applied Physics Lab.
ARCTIC TECHNOLOGY DEVELOPMENT AT THE UNIVERSITY OF WASHINGTON Final Report, 1 Jul. 1971 - 1 Aug. 1972
Stanley R. Murphy 11 Sep. 1972 106 p refs
(Contract N00014-67-A-0103-0016; ARPA Order 1668)
(AD-748228; APL-UW-7219-App-A) Avail: NTIS CSCL 08/12

A synopsis of the sponsored arctic technology development at the University of Washington is presented. This includes a description of technical management activities, a description of several concepts for new arctic technology, and a description of the development and successful arctic operation of an under-ice research submersible (UARS). An appendix gives a complete technological description of the UARS system. Author (GRA)

N73-13396# Chapman (Seville), Buffalo, N.Y.
INVESTIGATION OF ATMOSPHERIC IONIC SPECTRA Final Report, 1 Jul. 1971 - 30 Aug. 1972
Seville Chapman 30 Aug. 1972 26 p refs
(Contract N00014-71-C-0324; NR Proj. 082-273)
(AD-747687) Avail: NTIS CSCL 07/4

As a preliminary to study of natural ionization in the atmosphere, ions from corona point discharge in air 20 C, 740 torr have been studied by a high-resolution time-of-flight mobility apparatus with a best resolution (width of peak at half height) of 2.5 percent. It is believed this level of resolution has not been achieved before at these pressures. Relative intensities of some ions are influenced by magnitude of current in the discharge without change of mobility. Other ion mobilities are influenced by both humidity and current. In general greater humidity results in a slower centroid of mobility. The mobility spectrum of dry nitrogen is quite different from that of air at ordinary humidities. Author (GRA)

N73-13397# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
HOW DRY IS THE SKY: A DECADE LATER AND THE SST Air Force Surveys in Geophysics
Norman Sissenwine, Arthur J. Kantor, and Donald D. Grantham 27 Apr. 1972 31 p refs
(AF Proj. 8624)
(AD-748797; AFCRL-AFSIG-240; AFCRL-72-0294) Avail: NTIS CSCL 04/1

Water vapor that would be added to the stratosphere by a potential fleet of SSTs is related to the most accepted humidity balance in the stratosphere based on general circulation considerations, and to moisture introduced into the stratosphere by vaporization from convective clouds. A mean residence time of 25 months for water vapor was calculated from general circulation values. On the assumption that other water vapor reaching the stratosphere was an equal time of residence, a fleet of SSTs would increase humidity by 0.5 ppm or 25 percent of the generally accepted 2 ppm equilibrium value. Vaporization of only 1 percent of the convective cloud mass, calculated herein to enter the stratosphere, would increase its mixing ratio by 1 ppm. Author (GRA)

N73-13398# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
ARCTIC IONOSPHERE MODELLING: FIVE RELATED PAPERS
George J. Gassmann, Jurgen Buchau, Rosemarie A. Wagner, Charles P. Pike, and Martin G. Hurwitz 16 May 1972 62 p refs
(AD-748796; AFCRL-72-0305; AFCRL-AFSIG-241) Avail: NTIS CSCL 04/1

Contents: Instantaneous versus averaged ionosphere; Modelling the auroral E-layer; Model of Arctic sporadic E; Modelling the Arctic F-layer; Coordinate conversion and other computer programs for Arctic ionospheric research. GRA

N73-13399# Michigan Univ., Ann Arbor. Inst. of Science and Technology.
TUNNEL-SITE SELECTION BY REMOTE SENSING TECHNIQUES Final Report, 1 Apr. 1971 - 4 Mar. 1972
Thomas Wagner, Robert Vincent, Ben Drake, Ralph Mitchel, and Philip Jackson Sep. 1972 101 p refs
(Contract DI-BM-HO-210041)
(AD-748663; Rept-10018-13-F) Avail: NTIS CSCL 08/7

A study of the role of remote sensing for geologic reconnaissance for tunnel-site selection was commenced. For this study, remote sensing was defined as ultraviolet to thermal infrared multispectral scanning, X- and L-band synthetic aperture radar, and aerial photography. Data from these sensors were processed and evaluated in terms of their complementary use. This report can be used tutorially on the data processing and basic instrumentation of conventional remote sensing. Future research directions are suggested, and the extension of remote sensing to include airborne passive microwave sensor systems, magnetometry, gamma-ray sensors, gravimetry, and airborne electromagnetic sounding systems is discussed. Author (GRA)

N73-13400# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
ICE THICKNESS OBSERVATIONS, NORTH AMERICAN ARCTIC AND SUBARCTIC, 1968-1969, 1969-1970 Special Report, Aug. 1968 - Jul. 1970
Michael A. Bilello and Roy E. Bates Jun. 1972 100 p refs
(DA Proj. 4A0-61102-B-52-E)
(AD-746256; CRREL-SR-43-Pt-6) Avail: NTIS CSCL 08/12

This sixth in a series of reports on lake and river ice and land-fast sea ice records ice thicknesses observed throughout the North American Arctic and subarctic during the 1968-69 and 1969-70 seasons. Information on ice surface conditions, dates of first ice, freeze-over and breakup, and measurements of ice thickness made on the second voyage of the S.S. Manhattan are also included. Continued reports from the Alaska National Guard Network on ice thickness measurements on lakes and rivers in the remote regions of interior Alaska are presented.

Analyses are made of maximum observed ice thicknesses reported during the two winters in North America, including data from additional stations in western Alaska. Author (GRA)

N73-13401# TRW Systems Group, Redondo Beach, Calif.
HIGH ALTITUDE PLASMA EFFECTS Technical Report, 28 Feb. - 25 Jul. 1972
Donald Arnush, Burton D. Fried, Charles F. Kennel, and Alfred Y. Wong 25 Jul. 1972 29 p refs
(Contract F30602-72-C-0304; ARPA Order 1423)
(AD-748311; TRW-21961-6004-RO-00; RADC-TR-72-209) Avail: NTIS CSCL 04/1

A major objective of this contract is to construct a Quiescent Uniform Ionospheric Plasma Simulator (QUIPS) to be used in analyzing and modeling the results of various field experiments in which a region of the ionosphere was artificially excited by a radar scattering. In this report the general design considerations for the facility are reviewed and a final design and fabrication schedule is presented. The current status of the construction as well as some of the preparations for the performance of the follow-on activities are described. Author (GRA)

N73-13402# Lamont-Doherty Geological Observatory, Palisades, N.Y.
VEMA 17 DATA Technical Report, Dec. 1960 - Sep. 1961
Maurice Ewing, J. Lamar Worzel, and Thomas D. Aitken Aug. 1972 301 p refs
(Contract N00014-67-A-0108-0004; Grant NSF GA-27281; NR Proj. 083-142)
(AD-747652; TR-6-CU-6-72; Vema-Res-Ser-Vol-3) Avail: NTIS CSCL 08/10

The technical report is a compilation of the data collected during Cruise 17 of the Research Vessel VEMA from December 1960 to September 1961 in the following disciplines: cores; heat flowthermograd; bottom photography; geological sampling (dredge); trawl, water barrel; geochemistry-Strontium 90; hydrography; seismic refraction; and plankton. Author (GRA)

N73-13403# Naval Undersea Center, San Diego, Calif. Ocean Technology Dept.
PROJECT DEEP OPS EQUIPMENT DEVELOPMENT Final Report, Sep. 1969 - Dec. 1970
G. W. Ching and H. O. Porter Jun. 1972 19 p
(AD-747612; NUC-TP-296) Avail: NTIS CSCL 08/1

The report describes the special equipment developed in support of Project Deep Ops, a program to determine the feasibility of using trained pilot and killer whales to aid in the recovery of pingered objects from the ocean floor. The major pieces of equipment developed were a mouthpiece, a target attachment device, a practice target, a backpack, and a transport system. Author (GRA)

N73-13404# Scripps Institution of Oceanography, La Jolla, Calif.
PHYSICAL AND CHEMICAL DATA FROM CRUISE 41 OF USNS ELTANIN IN SOUTHERN OCEAN BETWEEN AUSTRALIA AND ANTARCTICA, 20 DECEMBER 1969 - 16 FEBRUARY 1970
1972 68 p refs Prepared in cooperation with Flinders Univ., Bedford Park (Australia) and Johns Hopkins Univ., Baltimore Sponsored in part by NSF
(Contract N00014-69-A-0200-6006)
(AD-747792; SIO-REF-72-19; HLC-10) Avail: NTIS CSCL 08/10

The primary purpose of Cruise 41 was to launch three Munk-Snodgrass internally recording tide capsules at 40, 50 and 60 degrees S along 132 degrees E (during the first leg) and to retrieve the capsules after they had spent approximately one month on the bottom (during the second leg). This data report presents only the hydrographic cast materials. Author (GRA)

N73-13405# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
GRAVIMETRIC MAP OF AUSTRALIA
N. P. Grushinskii and N. B. Sazhina Jul. 1972 13 p Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 202, no. 3, 1972 p 580-582
(AD-747873; DMAAC-TC-1863) Avail: NTIS CSCL 08/5

The paper discusses the gravimetric map of Australia. It consists of five sheets; on four of them special gravimetric features are shown, and on the fifth a diagram of the used material, tables indicating its characteristics, and the text explanations are presented. The map was published in 1970. Author (GRA)

N73-13406# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
PRINCIPLE OF MASS SWEEPING IN THE INTERPRETATION OF THE REGIONAL GRAVITY FIELD
H. Ya. Holizdra Jul. 1972 12 p refs Transl. into ENGLISH from Akad. Nauk URSR. Dopovidi, Ser. B., Geol., Geofizyka, Khim. ta Biol. (Kiev), no. 1, 1972 p 31-33
(AD-747874; DMAAC-TC-1864) Avail: NTIS CSCL 08/5

The sweeping of masses theory has been frequently used in the search for possible solutions to the inverse gravimetric problem. The paper also considers the case of sweeping the masses into a horizontal layer. This seems to have an important function in the construction of a method of interpretation of the regional gravity field. Author (GRA)

N73-13407# Scripps Institution of Oceanography, La Jolla, Calif. Advanced Ocean Engineering Lab.
ADVANCED OCEAN ENGINEERING LABORATORY Technical Progress Report, 1 Jan. - 30 Jun. 1972
William A. Nierenberg, Fred N. Spiess, Walter H. Munk, William A. Prothero, Douglas L. Inman, and William G. VanDorn 30 Jun. 1972 62 p refs
(Contract N00014-69-A-0200-6012; ARPA Order 1348; ARPA Order 1730)
(AD-748024; AOEL-29; SIO-Ref-72-72) Avail: NTIS CSCL 08/10

The semi-annual report reflects the technical status of projects conducted within the Advanced Ocean Engineering Laboratory at the Scripps Institution of Oceanography. These projects are: to conceive, design, build and demonstrate the feasibility of large stable floating platforms in the open sea; a program to develop and construct a quartz vertical accelerometer appropriately packaged and adapted for long term ocean bottom or perhaps sub-bottom use; field studies of the water-sediment interface under wave action in and near the breaker zone; and laboratory investigation of the velocity field of breaking waves; use of radio signals scattered from the sea surface to determine the directional spectrum of ocean waves; and a projected two-year laboratory and field investigation of the factors controlling the breaking of mixed-frequency wave systems in deep water. Author (GRA)

N73-13408# Delaware Univ., Newark. Dept. of Civil Engineering.
BOTTOM TOPOGRAPHY EFFECTS ON OCEAN CURRENTS Ph.D. Thesis. Geophysical Fluid Dynamics Report No. 6
John Riddoch Guala, Jr. Jun. 1972 138 p refs
(Contract N00014-70-A-0113-0002; NR Proj. 083-259)
(AD-748008) Avail: NTIS CSCL 08/3

The effects of bottom topography on ocean currents are considered. It is shown that a laminar laboratory model with height to width ratio differing from that of large scale geophysical motions can be used to model topographic effects on ocean currents. The governing vorticity equation is solved analytically for the flow over long constant cross-section ridges. The vorticity equation, given by a balance of inertial, Ekman suction and topographic terms, is solved numerically for the behavior of the Antarctic Circumpolar Current in the vicinities of both the Macquarie and Kerguelen-Gaussberg Ridges. GRA

N73-13409# Stanford Research Inst., Menlo Park, Calif.
MEASUREMENTS IN SUPPORT OF THE OOSIK EXPERIMENT Interim Technical Report, 1 Feb. - 1 May 1972
George B. Carpenter May 1972 20 p refs
(Contract N00014-72-C-0394; ARPA Order 2141)
(AD-749016) Avail: NTIS CSCL 04/1

At 0659 GMT March 7, 1972 a shaped barium charge was released high above central Alaska by the Los Alamos Scientific Laboratory and the University of Alaska. In support of this experiment, known as OOSIK, Stanford Research Institute operated two existing radar facilities in Alaska. In addition, a low-frequency receiving site was established and operated near the down-field intercept of the barium release. A preliminary analysis of the data indicates that a magnetic substorm began

17 minutes after the injection and was accompanied by considerable auroral activity. A number of factors suggest that the substorm was not triggered by the barium injection but was of natural origin. If a magnetospheric instability was later triggered by the barium release its effects were masked by the natural event. Author (GRA)

N73-13410# Naval Research Lab., Washington, D.C.
LONG WAVE RADIATION DIVERGENCE OVER WATER AND LAND FROM MEASUREMENT AND CALCULATION
Hans Hinzpeter and Manfried Heinrich 14 Aug. 1972 12 p refs Transl. into ENGLISH from Ann. Meteorol. (Offenbach am Main), no. 4, 1969 p 248-251
(AD-748997; NRL-Trans-1255) Avail: NTIS CSCL 04/1

Measurement series from ten levels between 1 and 6 m above the earth's surface are discussed. A comparison between the measured divergences and those calculated from simultaneously measured temperature and humidity profiles indicates the large possible errors caused by inhomogeneities of the surface temperature field. If these are eliminated, which is relatively simple over a water surface, the differences between calculated and measured divergences at these levels is less than 20%, on the average. The relative variation of the divergence with height is somewhat greater over water than over land, due to the different temperature profiles. Author (GRA)

N73-13411# Army Foreign Science and Technology Center, Charlottesville, Va.
SYMPOSIUM OF REPRESENTATIVES OF GEODETIC SERVICES OF THE SOCIALIST COUNTRIES ON ELECTRONIC MEASUREMENT OF DISTANCE
A. A. Gennika and Yu. G. Bugaev 30 Jun. 1972 10 p Transl. into ENGLISH from Geod. i Kartografiya (USSR), no. 9, 1971 p 67-73
(AD-748067; FSTC-HT-23-1263-72) Avail: NTIS HC $3.00 CSCL 08/5

The fifth symposium was held at Prague in October 1970. Reports on the following main trends were presented: methods of raising the accuracy of physical reductions in electromagnetic measurements of distances; reduction of the effect of reflected radiowaves on the accuracy of radar rangefinder measurements; reference standardizing of electronic rangefinders and investigation if instrumental errors; development of new and improvement of existing rangefinders; generalization of the operating experience of rangefinders in different kinds of geodesic work; and use of electronic rangefinders in other applied problems and the partial automation of topographic, geodesic work. GRA

N73-13606 Joint Publications Research Service, Arlington, Va.
VARIABILITY OF THE TEMPERATURE FIELD OF THE TROPOSPHERE, STRATOSPHERE AND MESOSPHERE IN THE WINTER
I. V. Bugayeva, L. A. Ryazanova, and D. A. Tarasenko *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 24-29 refs (For availability see N73-13602 04-20)

N73-13607 Joint Publications Research Service, Arlington, Va.
ALTITUDE AND TEMPERATURE OF THE TROPOPAUSE OVER THE NORTHERN HEMISPHERE
Z. M. Makhover *In its* Meteorology and Hydrol., No. 7, Jun. 1972 28 Sep. 1972 p 30-39 refs (For availability see N73-13602 04-20)

N73-13609 Joint Publications Research Service, Arlington, Va.
LIGHT AND ULTRAVIOLET ALBEDO OF SOME NATURAL UNDERLYING SURFACES
M. P. Garadzha and T. V. Yevnevich *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 47-56 refs (For availability see N73-13602 04-20)

N73-13611 Joint Publications Research Service, Arlington, Va.
STATISTICAL EIGENFUNCTIONS OF SEA LEVEL SURGES
G. V. Alekseyev and N. A. Romanov *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 68-73 refs (For availability see N73-13602 04-20)

N73-13612 Joint Publications Research Service, Arlington, Va.
LONG PERIOD WAVE PHENOMENON
A. L. Bondarenko *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 74-87 refs (For availability see N73-13602 04-20)

N73-13616 Joint Publications Research Service, Arlington, Va.
BOOK REVIEW: OUTLINES OF THE DEVELOPMENT OF HYDROLOGY IN THE USSR
P. S. Kuzin *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 104-111 (For availability see N73-13602 04-20)

N73-13838* International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
APPLICATION OF REMOTE SENSING TO SOLUTION OF ECOLOGICAL PROBLEMS
Andrew Adelman *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 105-108 (For availability see N73-13829 04-30)
CSCL 05K

N73-13839* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPLICATIONS OF REMOTE SENSING TO STREAM DISCHARGE PREDICTIONS
Fritz R. Krause and C. Byron Winn (Colo. State Univ.) *In its* Space for Mankind's Benefit 1972 p 109-119 refs (For availability see N73-13829 04-30)
CSCL 05H

N73-13841* Alabama Univ., University. Dept. of Civil and Medical Engineering.
USE OF DATA FROM SPACE FOR EARTH RESOURCES EXPLORATION AND MANAGEMENT IN ALABAMA
Phillip E. LaMoreaux (Ala. State Oil and Gas Board) and Harold R. Henry *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 143-148 (For availability see N73-13829 04-30)
CSCL 05F

N73-13843* Allied Research Associates, Inc., Concord, Mass.
SATELLITE OBSERVATIONS OF TEMPORAL TERRESTRIAL FEATURES
George Rabchevsky *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 155-179 refs (For availability see N73-13829 04-30)
CSCL 05F

N73-13844* Pennsylvania State Univ., University Park.
INTERDISCIPLINARY APPLICATIONS AND INTERPRETATIONS OF REMOTELY SENSED DATA
G. W. Peterson and G. J. McMurtry *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 181-186 refs (For availability see N73-13829 04-30)
CSCL 05H

N73-13845* Battelle Columbus Labs., Ohio. Aerospace Mechanics Div.
ORBITAL SURVEYS AND STATE RESOURCE MANAGEMENT
George Wukelic, T. L. Wells (State of Ohio Dept. of Develop.), and B. R. Brace *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 187-197 refs (For availability see N73-13829 04-30)
CSCL 05F

N73-13846* Colorado State Univ., Fort Collins.
RIVERBED FORMATION
Morris Skinner *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 199-210 refs Original contains color illustrations (For availability see N73-13829 04-30)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N73-13412 National Lending Library for Science and Technology, Boston Spa (England).

INFLUENCE OF THE STRENGTH OF HARMONICS ON VOLTMETER READINGS

A. Doumenc 27 Jul. 1972 20 p Transl. into ENGLISH from Bull. Dir. Etud. Rech., Ser. B. (France), v. 4, 1971 p 29-48 (NLL-ESB-Trans-499-(3810.97)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The influence of the strength of harmonics on the difference in voltmeter readings is determined based on different principles (voltmeters for double alternation rectification, peak voltmeters, voltmeter to measure the trough) and those of a voltmeter which measures the effective value of the voltage. This precedes a deduction of the errors which are liable to distort the effective measurement with other voltmeters than the effectual voltmeter. The choice of the effectual value as a reference value for the calculation of errors is governed by the importance of that value in the range of lighting and by the fact that the standard equipment currently used is sensitive to the effect and value. Author

N73-13413 British Broadcasting Corp., Kingswood (England). Engineering Div.

ACOUSTIC SCALING: INSTRUMENTATION

H. D. Harwood and K. F. L. Lansdowne Sep. 1972 14 p refs (BBC-1972/34) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A model of one-eighth linear dimension was constructed of an existing studio. In addition to carrying out objective tests, such as reverberation time, stereo music free of reverberation is played at eight times normal speed into the model and recorded by miniature microphones on a special tape recorder. The recording is then played back at normal speed and the resulting audio-frequency program can be compared with that recorded in the real studio. Details are given of the methods used to enable adequate signal-to-noise ratio of the final recording to be obtained, a high degree of reproduction to be achieved by the loudspeakers, and a rapid drying cycle to be maintained. D.L.G.

N73-13414 British Broadcasting Corp., Kingswood (England). Research Dept.

A NOTE ON DICHROIC GRATINGS FOR COLOUR ENCODING

Sep. 1972 14 p refs (BBC-1972/32; PH-93) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The information encoding action of a pair of dichroic gratings (sometimes known as striped filters) was analyzed in general terms, using the effect on the spatial frequency spectrum of the image of a scene to reveal their intrinsic properties. Two color television camera systems based on a single pickup tube are discussed, and an attempt is made to assess the physical tolerances required in the construction of suitable dichroic gratings for this application. Finally, several technological processes which might be used to construct gratings with multilayer dielectric coatings are mentioned. Author

N73-13415* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

FLOW VELOCITY AND DIRECTIONAL INSTRUMENT Patent

Donald L. Maiden, James H. Monteith, and Thomas D. Carpini, inventors (to NASA) Issued 24 Oct. 1972 6 p Filed 27 Jul. 1971 Supersedes N72-21417 (10 - 12, p 1608) (NASA-Case-LAR-10855-1; US-Patent-3,699,811; US-Patent-Appl-SN-166541; US-Patent-Class-73-189; US-Patent-Class-73-147; US-Patent-Class-73-182; US-Patent-Class-73-212) Avail: US Patent Office CSCL 14B

An instrument for providing measurements of both the magnitude and direction of flow velocities in a flow field is described. A probe is oriented in the flow field by two servo systems which impart two angular motions to the probe to align it with the direction of the flow. The two angular motions are indicative of the direction of flow and the magnitude of the flow velocity is then measured by conventional means.

Official Gazette of the U.S Patent Office

N73-13416* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

APPARATUS FOR VIBRATIONAL TESTING OF ARTICLES Patent

James J. Kerley, Jr. and Norman C. Schaller, inventors (to NASA) Issued 24 Oct. 1972 12 p Filed 3 Aug. 1971 Supersedes N72-21435 (10-12, p 1611) (NASA-Case-GSC-11302-1; US-Patent-3,699,807; (Patent-Appl-SN-168650; US-Patent-Class-73-71.6) . Avail: US Patent Office CSCL 14B

Equipment is described for vibrational testing of manufactured assemblies, components, and other articles. The apparatus consists of a vibration table having a generally planar supporting surface for the article being tested, at least a pair of actuating pistons for creating vibrational movement of the table along a primary axis generally perpendicular to the plane of the supporting surface and other pistons for transverse vibration. The test equipment may also be mounted on a testing centrifuge for adding an essentially constant gravitational accelerating force.

Official Gazette of the U.S. Patent Office

N73-13417* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

METHOD OF MAKING APPARATUS FOR SENSING TEMPERATURE Patent

Ronald G. Huff, inventor (to NASA) Issued 24 Oct. 1972 4 p Filed 26 May 1971 Supersedes N72-11374 (10 - 02, p 0198) Continuation-in-part of US Patent Appl. SN-877717, filed 18 Nov. 1969 (NASA-Case-XLE-05230-2; US-Patent-3,699,645; US-Patent-Appl-SN-147099; US-Patent-Class-29-573; US-Patent-Class-29-624; US-Patent-Class-136-233; US-Patent-Appl-SN-877717) Avail: US Patent Office CSCL 14B

An apparatus for measuring the surface temperature of a wall heated by a flowing fluid without disturbing the boundary layer is described. A thin electrical conductor forming a thermocouple junction is covered by a layer of protective material to guide the flow of fluid over the junction.

Official Gazette of the U.S. Patent Office

N73-13418* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

DIFFERENTIAL PRESSURE CONTROL Patent

Harold M. Smyly, inventor (to NASA) Issued 17 Oct. 1972 6 p Filed 26 Jun. 1970 Supersedes N70-35564 (08 - 19, p 3540) (NASA-Case-MFS-14216; US-Patent-3,698,412; US-Patent-Appl-SN-50208; US-Patent-Class-137-81; US-Patent-Class-92-49; US-Patent-Class-137-487.5) Avail: US Patent Office CSCL 13G

A differential pressure control for activation in response to the difference in pressure between two applied pressures where one pressure is applied to an outer side of a first diaphragm and the other pressure is applied to an outer side of a second diaphragm is described. The inner sides of the diaphragms are positioned face to face within a central chamber to which is applied a reference pressure. An electrical switch is operated by the movement of one of the diaphragms in response to a difference in the applied pressures, which response is a function of the reference pressure, the ratio of diaphragm surface areas, and one of the applied pressures.

Official Gazette of the U.S. Patent Office

N73-13419* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PROCESS FOR THE PRODUCTION OF STAR TRACKING RETICLES Patent

Wade O. Smith and Albert R. Toft, inventors (to NASA) Issued 14 Nov. 1972 5 p Filed 12 Oct. 1970 Supersedes N71-28653 (09 - 16, p 2925)

(NASA-Case-GSC-11188-1; US-Patent-3,702,808; US-Patent-Appl-SN-80029; US-Patent-Class-204-15) Avail: US Patent Office CSCL 14B

A method for the production of reticles, particularly those for use in outer space is reported. The product is a quartz base coated with highly adherent layers of chromium, chromium-silver, and silver vacuum deposited through a mask, and then coated with an electrodeposit of copper from a copper sulfate solution followed by an electrodeposit of black chromium. The mask produced is used in the vacuum deposition of: (1) chromium metal on the surface of a quartz base to obtain a highly adherent quartz-chromium interface; (2) silver on the chromium deposit, during the final stage of chromium deposit, to produce a silver-chromium alloy layer; and (3) silver onto the surface of the alloy layer. The coated quartz base is then coated by electroplating utilizing an acid copper deposit followed by a black chromium electrodeposit.

Official Gazette of the U.S. Patent Office

N73-13420* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ROTARY VANE ATTENUATOR WHEREIN ROTOR HAS ORTHOGONALLY DISPOSED RESISTIVE AND DIELECTRIC CARDS Patent
Charles T. Stelzried, Tom Y. Otoshi, David L. Nixon, and Robert W. Beatty, inventors (to NASA) Issued 14 Nov. 1972 4 p Filed 29 Oct. 1971 Supersedes N72-20393 (10 - 11, p 1472) Sponsored by NASA
(NASA-Case-NPO-11418-1; US-Patent-3,702,979; US-Patent-Appl-SN-193947; US-Patent-Class-333-81B; US-Patent-Class-333-98R) Avail: US Patent Office CSCL 14B

A rotary vane attenuator is described, comprising two stators and an intermediary rotor, each with a resistive card. The rotor, in addition to the resistive card, includes an orthogonally disposed card of dielectric material which has no resistive film thereon.

Official Gazette of the U.S. Patent Office

N73-13421*# Lockheed Missiles and Space Co., Palo Alto, Calif. Engineering Sciences Lab.
DEVELOPMENT OF TECHNIQUES AND ASSOCIATED INSTRUMENTATION FOR HIGH TEMPERATURE EMISSIVITY MEASUREMENTS Quarterly Progress Report, 29 Jun. - 28 Sep. 1972
G. R. Cunnington and A. I. Funai 28 Sep. 1972 55 p refs
(Contract NAS8-26304)
(NASA-CR-123968; LMSC-D309948) Avail: NTIS HC $4.75 CSCL 14B

The calibrating and testing procedures for the radiometric emittance measurement apparatus are described. Test results are given for the NBS platinum-rhodium standard (SRM No. 1409), the NBS oxidized Kanthal standard, and the oxidized Rene 41 materials. Results indicate that with the platinum-rhodium standard the measurement system compared with the NBS data to within 0.02 for both total and spectral normal emitttance. Data from the Kanthal strip was consistently higher than NBS values. For oxidized Rene 41, no significant changes in as prepared emittance were observed. The emittance was stable for temperatures up to 1150 K. Author

N73-13422# Australian Post Office Research Labs., Melbourne.
PROGRAMMABLE LOGIC TESTER
N. Gale Jul. 1970 28 p
(Rept-6570) Avail: NTIS HC $3.50

A high speed static tester consisting mainly of storage and decoding was developed which is capable of performing a simple GO/NO GO test of logic circuitry. The device is computer driven with all decision making, comparison, and sequencing under program control. The terminal, its operation, and the program description are described. D.L.G.

N73-13423# Aeronautical Research Labs., Melbourne (Australia).
ANALOGOUS SPECIMEN-COIL ARRANGEMENTS IN EDDY CURRENT TESTING
I. G. Scott Dec. 1971 36 p refs
(ARL/Met-Rept-88) Avail: NTIS HC $4.00

It is clear from studies of impedance diagrams that an approximate equivalence exists between differing coil-specimen arrangements. Analytic verification of this equivalence was sought, using as a starting point the computer-orientated derivations of Dodd and Deeds and the classical solutions for specimens of circular cross section. The resultant findings are simply stated and, despite the need to make a number of simplifying approximations, are considered to be useful working results.

Author

N73-13424# Research Inst. of National Defence, Stockholm (Sweden). Uppsala Ionospheric Observatory.
ROCKET-BORNE MOSFET ELECTROMETER
M. Nalini Mohan Rao Jul. 1971 57 p refs
(FOA-3-C-3640-E1; Rept-19) Avail: NTIS HC $5.00

Performance of a temperature compensated logarithmic electrometer amplifier, used in a rocket flight for the measurement of positive ion and electron densities in the lower ionosphere over Kiruna, is presented. Various aspects of the electrometers are discussed. Advantages and drawbacks have been pointed out. Author

N73-13425# La Plata Univ. (Argentina).
STUDY OF THE DESIGN AND CONSTRUCTION OF A PYROMETER FOR REGISTERING TEMPERATURES INSTANTLY [ESTUDIO, PROYECTO Y CONSTRUCCION DE UN PIROMETRO DE BRILLO PARA REGISTRAR TEMPERATURAS INSTANTANEAS]
M. F. Fanchiotti and C. A. Zottig 1972 15 p refs In SPANISH
Avail: NTIS HC $3.00

The results are presented of measuring flame temperatures, by probes, in the exhaust nozzle of a rocket engine, and in the combustion chamber. The range of measured temperatures was from 750 to 3000 C. The equipment consisted of an electro-optic receptor and a register. Calibration was accomplished by comparison to a tungsten filament. Transl. by F.O.S.

N73-13426# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
AN EVALUATION OF SEVERAL CRYOGENIC TURBINE FLOWMETERS
J. A. Brennan, R. W. Stokes, D. B. Mann, and C. H. Kneebone Oct. 1972 91 p refs Sponsored by Compressed Gas Assoc.
(NBS-TN-624) Avail: SOD $1.00 as C13.46:624

A cryogenic flow research facility was constructed and has been used to evaluate cryogenic flowmeters operating on several different principles. The operation and the accuracy of the flow facility is briefly described. The performance of the flowmeters in liquid nitrogen is described by reporting the precision and bias of the meters before and after an 80-hour stability test and by defining the existence of temperature, pressure, flow rate, subcooling, and time order (wear) dependencies. Meters were evaluated with flow rates ranging from 20 to 210 gpm, pressures ranging from 32 to 112 psia, and with temperatures ranging from 72 to 90 K. Author

N73-13427*# Techtran Corp., Glen Burnie, Md.
MEASUREMENT OF THE ENERGY SPECTRUM AND MEAN SQUARE DEVIATION OF DENSITY OF PHOTOGRAPHIC LAYERS
V. G. Gimpelson, A. I. Veytsman, and K. V. Vendrovskiy Washington NASA Dec. 1972 16 p refs Transl. into ENGLISH from Zh. Nauchn. i Prikl. Fotogr. i Kinematogr. (Moscow), v. 15, no. 5, Sep.-Oct. 1970 p 387-394
(Contract NASw-2037)
(NASA-TT-F-14614) Avail: NTIS HC $3.00 CSCL 14E

The principal concepts and relationships used to measure density and grain in photographic films are discussed, with emphasis on the type of scanner used and the shape of the measurement slit. Author

N73-13428# Grumman Aerospace Corp., Bethpage, N.Y. Fluid Dynamics.
THE GRUMMAN AIR MONITOR SYSTEM
K. M. Foreman Nov. 1972 26 p refs
(RM-559) Avail: NTIS HC $3.50

An automated air sampling system was developed that can be used in any transportation vehicle to monitor local air quality. This system is particularly useful for a concept to obtain worldwide profiles of air quality, for example, using commercial airliners. The system consists of a controller module and modular collection

and storage units, each containing five 5-liter inflatable bags. These bag storage units have the dimensional characteristics of a 26-inch suitcase and can be interconnected in series to increase the total sampling capacity of the system up to 99 each day. Automatic inflation of any one aluminum-coated mylar or Teflon bag of an installed system can be programmed for any portion of a 24-hour period. Analysis of the bagged contents is to be made in a suitably equipped laboratory physically unrelated to the monitoring vehicle or its journey. Operational characteristics of the equipment and the technique are given to show its suitability for the proposed applications. Author

N73-13429*# Perkin-Elmer Corp., Norwalk, Conn. Optical Group.
ADVANCED FIGURE SENSOR OPERATIONS AND MAINTENANCE MANUAL
Hugh J. Robertson 15 Mar. 1972 53 p
(Contract NAS5-21546; Proj. SPO-33018)
(NASA-CR-130125; Rept-11006) Avail: NTIS HC $4.75 CSCL 14B

This manual contains procedures for installing, operating, and maintaining the optical figure sensor and its associated electronic controls. The optical figure sensor, a system of integrated components, comprises: (1) a phase measuring modified interferometer employing a single frequency 6328 A laser, and a Vidissector; (2) a two-axis automatic thermal compensation control mount; (3) a five degree of freedom manual adjustment stand; and (4) a control console. This instrument provides real time output data of optical figure errors for spherical mirrors, and is also capable of measuring aspherical mirrors if a null corrector is added. Author

N73-13430*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN INVESTIGATION OF OPTICAL FEEDBACK TO EXTEND THE FREQUENCY RESPONSE OF SOLID-STATE DETECTOR SYSTEMS
Stephen J. Katzberg Washington Dec. 1972 12 p refs
(NASA-TM-X-2676; L-8590) Avail: NTIS HC $3.00 CSCL 14B

A primary limitation of many solid-state photodetectors used in electro-optical systems such as the facsimile camera is their slow response in converting light intensities into electrical signals. An optical feedback technique is presented which can extend the frequency response of systems that use these detectors by orders of magnitude without significantly degrading their signal-to-noise performance. This technique is analyzed to predict improvement, implemented, and evaluated to verify analytical results. Author

N73-13431*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WIND TUNNEL INVESTIGATION OF AN UNSWEPT AIRFOIL WITH A 0.098-CHORD BLOWING FLAP
Thomas R. Turner Washington Dec. 1972 32 p refs
(NASA-TM-X-2675; L-8573) Avail: NTIS HC $3.00 CSCL 01A

An investigation of the longitudinal aerodynamic characteristics of an aspect ratio 4.735 airfoil having a 9.8 percent chord blowing flap has been made in and out of ground influence over the endless moving belt ground plane in the 5.18 meter test section of the former Langley 300 MPH 7 by 10 foot wind tunnel. For flap deflections of 30 deg or less, at a height of 0.25 span, ground effect was negligible; but at this ground height, at a flap deflection of 60 deg and a lift coefficient of 8.0, the lift loss was 27 percent. The lift loss for this same condition becomes negligible at a height of one span. Author

N73-13432*# Wisconsin Univ., Madison. Dept. of Physics.
COAXIAL ANODE FOR BACKGROUND SUPPRESSION IN X-RAY PROPORTIONAL COUNTERS
A. N. Bunner, W. L. Kraushaar, D. McCammon, M. Vanderhill, and F. Williamson [1972] 18 p refs
(Contracts NAS5-11282)
(NASA-CR-130127) Avail: NTIS HC $3.00

A scheme which permits the ends (near the anode seals) as well as the bottom and sides of an X-ray astronomy proportional counter to be protected by anticoincidence guard counters is described. A rocket-borne test showed that the non-X-ray background is reduced by an additional factor of about 30 when the end guard counter feature is added. Author

N73-13433*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MOSSBAUER SPECTROMETER RADIATION DETECTOR Patent Application
Jag J. Singh, inventor (to NASA) Filed 8 Dec. 1972 9 p
(NASA-Case-LAR-11155-1; US-Patent-Appl-SN-313381) Avail: NTIS HC $3.00 CSCL 14B

A versatile Mossbauer spectrometer with high efficiencies in both transmission and backscattering techniques is described. The heart of the invention is a detector which includes an NaI(Tl) crystal for detecting radiation caused by the Mossbauer effect. The crystal has a hole in its center to allow the incident radiation to pass through and it is connected through two quartz optical windows to two photomultipliers such that all of the scintillation radiation produced by the radiation detected by the crystal will flow into the two photomultipliers. When used in a transmission technique the sample or scatterer is placed between the incident radiation source and the detector; and when used in a backscattering technique the detector is placed between the incident radiation source and the sample or scatterer such that the incident radiation will pass through the hole in the crystal and strike the sample. NASA

N73-13434*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AUTOMATIC QUADRATURE CONTROL AND MEASURING SYSTEM Patent Application
John F. Hamlet, inventor (to NASA) Filed 29 Nov. 1972 15 p
(NASA-Case-MFS-21660-1; US-Patent-Appl-SN-310616) Avail: NTIS HC $3.00 CSCL 14B

A quadrature component cancellation and measuring system is reported that detects the quadrature component from a primary signal and uses reference circuitry to define the phase of the quadrature component for detection. A Raysistor optical coupling control device connects an output from the detection system to a circuit driven by a signal based upon the primary signal. Combining circuitry connects the primary signal and the circuit controlled by the Raysistor device to subtract quadrature components. A known current through the optically sensitive element produces a signal defining the magnitude of the quadrature component. NASA

N73-13435*# George Washington Univ., Washington, D.C.
BACTERIA DETECTION INSTRUMENT AND METHOD Patent Application
William Renner and Robert D. Fealey, inventors (to NASA) Filed 9 Nov. 1972 18 p Sponsored by NASA
(NASA-Case-GSC-11533-1; US-Patent-Appl-SN-305013) Avail: NTIS HC $3.00 CSCL 14B

A method and apparatus for screening a sample fluid for bacterial presence are disclosed wherein the fluid sample is mixed with culture media of sufficient quantity to permit bacterial growth in order to obtain a test solution. The concentration of oxygen dissolved in the test solution is then monitored using the potential difference between a reference electrode and a noble metal electrode which are in contact with the test solution. The change in oxygen concentration which occurs during a period of time as indicated by the electrode potential difference is compared with a detection criterion which exceeds the change which would occur absent bacteria. NASA

N73-13436*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TEMPERATURE COMPENSATED DIGITAL INERTIAL SENSOR Patent Application
Patrick J. Hand, inventor (to NASA) Filed 9 Nov. 1972 26 p
(Contract NAS7-100)
(NASA-Case-NPO-13044-1; US-Patent-Appl-SN-305012) Avail: NTIS HC $3.50 CSCL 14B

A circuit for a gyroscope or accelerometer of the digital rebalance type, which corrects for temperture changes, is described. The circuit includes a temperature sensor whose output is amplified to obtain the temperature dependent signals. These signals are used as the reference voltages for comparators that also receive the output of a pickoff that senses gyroscope rotation. When the output of pickoff exceeds one of the reference

signals, one of the comparators generates a pulse which causes a rebalance pulse to be delivered to a torquer that returns the gyroscope to its original position. Variations in voltages compensate for variations in output of the pickoff that are caused by changes in viscosity of the gyroscope floatation fluid for a wide range of temperatures. The primary novel feature of the invention is the use of a single temperature sensor to create a temperature dependent signal which is delivered to two or more portions of the rebalancing circuit to correct for two or more temperature dependent errors. NASA

N73-13437*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN EXTREME ULTRAVIOLET PHOTOMETER FOR SOLAR OBSERVATIONS FROM THE ATMOSPHERE EXPLORER SATELLITES
Donald F. Heath and John F. Osantowski Dec. 1972 30 p refs
(NASA-TM-X-66130; X-651-72-457) Avail: NTIS HC $3.50 CSCL 20F

A broadband photometer experiment is being fabricated for the Atmosphere Explorer C, D and E missions to record the solar irradiance in the 40 to 1250 A region with seven distinct passbands. The experiment consists principally of four spinal electron multipliers located behind a moving eight position filter wheel. Six metallic filters are used to spectrally isolate the solar irradiance. In addition three Al2O3 diodes, two with filters, are being used to record the solar irradiance over the range of orbital altitudes from perigee through apogee. A principal goal of the experiment will be to measure time dependence of the solar irradiance with respect to a storage ring synchrotron light source which has been calibrated in terms of the best currently available standards of irradiance. Author

N73-13438# Deutsches Elektronen-Synchrotron, Hamburg (West Germany).
KERR CAMERA WITH TEN PICOSECONDS TIME RESOLUTION
R. Fischer and R. Rossmanith Mar. 1972 10 p refs
(DESY-72/14) Avail: AEC Depository Libraries

A camera with a CS2-filled Kerr cell shutter is described. The shutter is opened by the pulse of a mode locked Nd-glass laser. Due to the short relaxation time of the CS2, a time resolution of 10 + or - 2 ps is attained. The camera with laser driven Kerr cell is designed for measuring light pulses emitted from relativistic electrons in high energy accelerators. Author (NSA)

N73-13439# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.
POSSIBLE DEVELOPMENT OF SUPERCONDUCTING INSTRUMENTATION WITH WEAK-LINK APPARATUS
E. P. Balsamo and G. F. Paterno 17 Jan. 1972 9 p refs In ITALIAN
(LNF-72/4) Avail: AEC Depository Libraries

The signs of the Josephson effect are summarized. Weak-link devices are described and their applications are discussed. Possible use of weak-link apparatus in superconducting instrumentation is then considered. NSA

N73-13440# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
EXPERIMENTAL STUDIES OF FLUSH-MOUNTED ELECTROSTATIC PROBES IN COLLISION-DOMINATED HYPERSONIC IONIZED FLOWS
Donald W. Boyer Jul. 1972 65 p refs Sponsored by AEC Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract SL-5023)
(SC-CR-723145) Avail: NTIS

An experimental investigation was made of ion-current collection by flush-mounted electrostatic probes on a sharp flat plate in ionized hypersonic flows. The effects of probe size, geometry, position, bias potential and local flow properties were investigated under conditions of a collision-dominated sheath. The probe current densities measured in nitrogen, argon, and carbon monoxide plasmas were correlated in terms of the ion convective flux, flow Reynolds number, probe size and bias potential. Author (NSA)

N73-13441# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.
ELECTRONICS FOR PROPORTIONAL WIRE CHAMBERS (REVIEW)
M. Turala 1972 42 p refs In RUSSIAN
(JINR-P13-6380) Avail: AEC Depository Libraries

The specifications for the readout electronics and some readout systems for proportional wire chambers are considered. The electronics circuits and logic organization are described for the case of using proportional wire chambers for coordinate measurements or selective triggering. Author (NSA)

N73-13442# Danish Atomic Energy Commission, Risoe. Research Establishment.
REMOTE RECORDING OF SPEED WITH LASER DOPPLER ANEMOMETRY
L. Lading Apr. 1972 24 p refs In DANISH Presented at the Symp. on Remote Analysis, Stockholm, 2-4 May 1972
(RISO-M-1489; CONF-720539-1) Avail: AEC Depository Libraries

Basic principles of the laser anemometer are given, especially the possibilities for remote atmospheric measurements. Two specific systems are described as examples of the state-of-the-art. Author

N73-13443# Battelle-Northwest, Richland, Wash.
TECHNOLOGICAL CONSIDERATIONS IN EMERGENCY INSTRUMENTATION PREPAREDNESS. PHASE 2-A: EMERGENCY RADIOLOGICAL AND METEOROLOGICAL INSTRUMENTATION CRITERIA FOR REACTORS
J. M. Selby, B. V. Anderson, L. A. Carter, J. P. Corley, C. E. Elderkin, R. L. Kathren, L. C. Schwendiman, C. M. Unruh, E. C. Watson, and R. K. Woodruff May 1972 125 p refs
(Contract AT(45-1)-1830)
(BNWL-1635) Avail: NTIS

Criteria for several instrument and instrumentation systems are presented. These include: (1) liquid and gaseous radiological effluent monitoring instrumentation, both within the facility and in the environs; (2) ambient radiation monitoring instrumentation; (3) portable radiological monitoring instrumentation; (4) meteorological instrumentation, both for synoptic and predictive purposes. The criteria are for instrumentation for determining the nature and extent of a radiological incident immediately after its occurrence. Emergency instrumentation criteria are examined for the contemporary reactor, in consonance with what is needed, reasonable, and achievable with the state-of-the-art, while at the same time identifying areas in which additional study is indicated. Instrumentation for meteorological parameter measurement is considered in detail because of the important role such measurements play in determining the direction of flow and dispersion in the atmosphere, and in the initial response by monitoring personnel. Author (NSA)

N73-13444# Technische Univ., Berlin (West Germany). Sonderforschungsbereich Magnetohydrodynamik.
MEASUREMENT OF LEVELS IN ALKALI METALS AT TEMPERATURES UP TO 900 C WITH RESISTOMETERS [FUELLSTANDSMESSUNG AN ALKALIMETALLEN BEI TEMPERATUREN BIS 900 C MITTELS WIDERSTANDSMESSELEMENTEN]
K. Wagner (DFVLR) Mar. 1971 87 p refs In GERMAN, ENGLISH summary
(SFB-MHD-2) Avail: NTIS HC $6.50

Level indicators are based on a thin wall being immersed in the tank of which the electrical resistance is measured. The length of thin tube is limited to about 1.5 m because of the material strength. Error due to incomplete temperature compensation amounts to 0.5%. Tests were carried out on potassium at 820 C with no failure. Haynes 25 tubes, which can be used up to 950 C, were manufactured. The experimental error is independent of the temperature, the atmosphere over the liquid surface (argon or potassium vapor), and the purity of the potassium. This error is approximately plus or minus 20 millimeters with calibrated instruments. When calibration is done with the instrument mounted on the tank, the error can be reduced to plus or minus 10 millimeters. This accuracy can only be obtained in certain conditions which are explained. Electronic equipment and measuring devices are described. Author (ESRO)

N73-13445# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
COMPARISON OF CONTACT ANALOG CHANNEL DISPLAY AND CONVENTIONAL INSTRUMENTATION BY MEANS OF SIMULATOR STUDIES [VERGLEICHENDE SIMULATOR-STUDIEN MIT DEM KONTAKTANALOGEN KANAL-DISPLAY UND MIT KONVENTIONELLEN INSTRUMENTIERUNGEN]
W. Schattenmann and V. Wilckens 1972 38 p refs In GERMAN; ENGLISH summary Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-100) Avail: NTIS HC $4.00

The precision of flight path guidance and control activity is compared in simulator tests for four different displays: standard ILS, accumulated ILS, flight director, and the contact analog channel display. Displays should offer a confidence-imminent survey, enhance the manual abilities of the pilot, and allow a flexible selection of flight trajectories. Some results on these matters are presented. It is shown that the channel display offers equivalent guidance precision compared to an optimized flight director. With regard to orientation and training quality as well as flexibility of path selection, the channel display is obviously superior. There are indications that it can produce an exceptionally high degree of confidence. Author (ESRO)

N73-13446# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
AN ON-BOARD DIGITAL CORRELATOR FOR SPACECRAFT VLF RADIO WAVE STUDIES
Dyfrig Jones Oct. 1972 43 p refs Presented at the Colloq. on l'Util. du Filtrage par Correlation en Geophys. et Astronomie, Lyon, 18-20 Oct., 1972
Avail: NTIS HC $4.25

Correlation techniques have rarely been used for VLF studies since it has been possible to arrive at the power spectra of the signals by other means. It is shown that the application of correlation analysis to VLF signals on board spacecraft has many advantages, not the least being a considerable decrease in the amount of data to be subsequently telemetered to the ground. The philosophy of the on-board correlator designed for the ESRO geostationary satellite GEOS is described in detail and its performance, tested by computer simulation studies, is compared with that of conventional ground-based spectrum analyzers. It is shown how such a correlator may be utilized for recognizing VLF signal patterns in the presence of noise. This type of correlator is also useful for studying plasma waves and, with minor modifications, the Poynting flux and k-vector of electromagnetic waves may be directly determined. Author (ESRO)

N73-13447# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Angewandte Gasdynamik.
ONE COMPONENT-STRAIN GAGE-BALANCE FOR MEASUREMENT OF VERY SMALL FORCES IN LOW-DENSITY WIND TUNNEL FLOWS [EINE EINKOMPONENTEN-MESSWAAGE AUF DEHNMESSTREIFER-BASIS ZUR MESSUNG SEHR GERINGER KRAEFTE IN WINDKANAL-STROEMUNGEN GERINGER DICHTE]
Reazul Huq Aug. 1971 28 p refs In GERMAN; ENGLISH summary
(DLR-MITT-71-30) Avail: NTIS HC $3.50; DFVLR, Porz, West Ger. 10,40 DM

A one component internal balance is described which operates on the basis of the strain gage principle. The characteristics of the balance permit its application to forces as low as 1 mN (0 1p). The calibration shows balance signal reproducibilities of plus or minus 1.5% or better. Author (ESRO)

N73-13448# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Div. Electronique et Mesures.
THRESHOLDS OF ACCELEROMETERS FOR SPACE APPLICATIONS AND OF DRAG-FREE SPACECRAFT DETECTORS [SEUILS DES ACCELEROMETRES POUR APPLICATIONS SPATIALES ET DES DETECTEURS DE SPATIONEF A TRAINEE COMPENSEE]
Remy Juillerat 1972 43 p refs in FRENCH; ENGLISH summary
(ONERA-NT-199) Avail: NTIS HC $4.25

The thresholds of a triaxial accelerometer and a drag-free space probe detector were investigated with emphasis on electrostatic perturbations, which constitute an intrinsic physical limitation. It is shown that the threshold of the accelerometer is 0.1 nm/sq sec, and that of the spinning drag-free space probe detector is 0.001 nm/sq sec in a plane normal to the spin axis. Author (ESRO)

N73-13449# Army Foreign Science and Technology Center, Charlottesville, Va.
AERIAL PHOTOGRAPHY
Aleksei Nikolaevich Lobanov 22 Aug. 1972 585 p refs Transl. into ENGLISH of the book "Aerofototopogr" Moscow, 1971 560 p
(AD-748871; FSTC-HT-23-868-72) Avail: NTIS CSCL 14/5

The report is a complete presentation of the theory and practice of aerial photography. Subjects covered range from the theory of the single photograph through planometric aerial triangulation and determination of elements on single photographs to the theory of paired photographs, stereometric methods of photointerpretation and the production of topographic maps from aerial photographs. Mapping of planets and their satellites and the automation of stereometric work are covered. A special section discusses prospects for future developments. Author (GRA)

N73-13450# Naval Weapons Lab., Dahlgren, Va.
MAGNETIC PROBES AND THE INSTRUMENTATION OF CAPACITIVE DISCHARGES
John A. Mazzie Mar. 1972 29 p refs
(AD-748610; NWL-TR-2792) Avail: NTIS CSCL 20/3

Equations have been derived for the output signal (V sub s) of an inductive probe excited by the capacitive discharge of a series RLC circuit. These equations are applicable to both the strongly coupled and the weakly coupled probe and can be used to obtain design criteria or to correctly interpret a measured output signal. Quite generally the equations show that the magnitude and time dependence of (V sub s) are not related to those of the discharge current by Mdi/dt unless certain inequalities exist between the three parameters alpha, beta and gamma. Author (GRA)

N73-13451# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACCELETRON, A NEW ELECTRONIC TRANSDUCER FOR MEASURING ACCELERATION
I. Khlebarov and K. Kolev 28 Jun. 1972 8 p Transl. into ENGLISH from Voenna Tekh. (Bulgaria), v. 4, no. 6, 1970 p 11-12
(AF Proj. 6095)
(AD-748885; FTD-HC-23-0887-72) Avail: NTIS CSCL 14/2

The acceletron, or electronic acceleration transducer, is an electronic tube with a mobile electrode. Hot, directly-heated oxide cathode K, suspended on a flat spring, is situated between two flat parallel electrodes (anode A and cold cathode CK). The acceletron is placed directly on the object whose acceleration is to be measured, its body being firmly attached to the object. The measuring axis X-X of the acceleratron must be so oriented as to be parallel or coincide with the axis of the object along which acceleration is to be measured. Author (GRA)

N73-13452# Ohio State Univ., Columbus. Dept. of Geodetic Science.
METRIC CALIBRATION OF THE AERIAL PHOTOGRAPHIC SYSTEM BY THE METHOD OF MIXED RANGES Final Technical Report, 16 Apr. 1971 - 14 Apr. 1972
Dean C. Merchant Jul. 1972 84 p refs
(Contract F30602-71-C-0249)
(AD-748812; DGS-172; RADC-TR-72-178) Avail: NTIS CSCL 14/5

A new procedure for the calibration of the aerial photographic system is described and the results of a live data demonstration are reported. The procedure, termed the Method of Mixed Ranges (MMR), utilizes a three-dimensional targeted control range simultaneously with a conventional level range in an adjustment in which the elements of interior orientation are carried as common parameters for all exposures. The use of the three-dimensional range for suppressing high correlations between certain elements of interior and exterior orientation is thought to be unique for the normal aerial case. The report describes the theory and results of the application of the MMR procedure to the Casa Grande

and Mt. Graham ranges located in Arizona. Ten photographs were simultaneously adjusted. The rms error of photo coordinate-residuals after adjustment was 5.1 micrometers determined from 250 coordinate observations. Author (GRA)

N73-13453# Army Electronics Command, Fort Monmouth, N.J.
POWER SUPPLY VOLTAGE MONITOR FOR BUILT-IN TEST EQUIPMENT (BITE) APPLICATIONS
Harry A. Wheeler Aug. 1972 20 p refs
(DA Proj. 1S6-62701-A-173)
(AD-748829; ECOM-4004) Avail: NTIS CSCL 14/4

The report describes the design of a power supply voltage monitor capable of monitoring multiple dc voltages simultaneously, indicating out-of-tolerance voltages on one single lamp. Design data and temperature testing results are included for a given design, as well as a computer program for obtaining data for the design of any additional system to be monitored.
Author (GRA)

N73-13454# ADCOLE Corp., Waltham, Mass.
ELECTRONIC INSTRUMENTATION FOR SOLAR RADIATION MEASUREMENTS Final Report, 1 Feb. 1968 - 31 Dec. 1971
Emilio A. Zeuli 12 Jan. 1972 138 p refs
(Contract F19628-68-C-0174; AF Proj. 6688)
(AD-748276; AFCRL-72-0017) Avail: NTIS CSCL 14/2

The report describes the design, construction, test and flight of the electronic portions of research instruments used on rockets and satellites for the investigation of extreme solar ultraviolet radiation. These instruments are grazing incidence grating monochromators for measurements in the 30-1300 Angstrom range, and retarding potential analyzers used for analysis of environmental charged particles. All the instruments are of a telemetering type. Associated equipment used for calibration and testing of the instruments in both the laboratory and the pre-launch phases is described. Automatic data reduction equipment was developed and used successfully. Experiments were flown on Aerobee 150, Aerobee 170, and Black Brant rockets, and the OV5-6 satellite. Author (GRA)

N73-13455# Air Force Academy, Colo.
SEISMOMETER COMPENSATION FOR ACCELERATION MEASUREMENTS
Dino A. Lorenzini and Jack P. Schunk Aug. 1972 33 p
(AF Proj. 7004)
(AD-748245; SRL-TR-72-0015) Avail: NTIS CSCL 17/7

The acceleration responses of two Hall-Sears 10 short period seismometers have been modified so that a flat output signal to input acceleration results between 0.1 Hz and 10 Hz. These instruments are to be used to actively control the pneumatically-supported isolation platform in the USAF Academy's Guidance and Control Laboratory. Descriptions of the notch filter compensation circuit and the transfer function measurement technique are given. The results obtained show that it is possible to keep the seismometer's acceleration response flat to plus or minus 2 db between 0.2 and 10 Hz by the appropriate selection of seismometer damping resistor and compensation circuit values. A simple gain adjustment procedure was used to match the compensated seismometer output magnitudes. Author (GRA)

N73-13456# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
USE OF THE VVDU-2 HIGH-PRESSURE VISCOSIMETER IN TESTING NATURAL WATERS
O. A. Likhacher and V. M. Fokeev 2 Feb. 1972 12 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. i Razvedka (Moscow), v. 10, no. 7, 1967 p 89-92
(AD-745252; FTD-MT-24-1090-71) Avail: NTIS CSCL 14/2

A viscometer design, based on the rate of swing of a ball through the test medium, was calibrated for use with natural waters. An increase in temperature of 5 degrees changed the transit time of the ball by 15-20 percent. The instrument did not measure the effect of dissolved carbon dioxide on decreasing the viscosity of water. Author

N73-13457# TRW Systems Group, Redondo Beach, Calif.
ACOUSTIC BUBBLE DETECTION: ACOUSTIC OPTICAL IMAGING TECHNIQUES FOR DECOMPRESSION STUDIES Final Report, 10 Mar. 1969 - 30 Sep. 1972
Donald C. Winter, Lee O. Heflinger, and Cameron Knox 30 Sep. 1972 47 p refs
(Contract N00014-69-C-0231)
(AD-749087; TRW-12833-60) Avail: NTIS CSCL 14/5

The acoustic-optical imaging process utilizes Bragg diffraction of light by a beam of sound to produce an optical image of an acoustically irradiated object. Inasmuch as many materials which are quite opaque to light are, to varying degrees, transparent to certain acoustic frequencies, the technique offers the possibility of visually examining the internal structure of optically opaque bodies. The imaging of internal features is made possible by the fact that different materials and structures often have different acoustic characteristics, thus causing the sound to be reflected, scattered, absorbed and diffracted. These factors cause perturbation in the acoustic wavefronts which are transformed in the light-sound interaction into a visual image, in real time, which may be observed by eye, photographed by a camera, or processed by other conventional optical methods. This program was directed toward an evaluation of the acoustic-optical imaging technique as a means of detecting bubbles formed in the circulatory system during decompression. Author (GRA)

N73-13458# Cornell Univ., Ithaca, N.Y. Materials Science Center.
INTRINSIC FLUCTUATIONS IN A SUPERCONDUCTING FLUX DETECTOR RING CLOSED BY A JOSEPHSON JUNCTION: THEORY AND EXPERIMENT
Lawrence D. Jackel, Juhani Kurkijaarvi, James E. Lukens, and Watt W. Webb 1 Sep. 1972 12 p refs Presented at 13th Intern. Conf. on Low Temp. Phys., Boulder, Colo., Aug. 1972
(Contract N00014-67-A-0077-0016; NR Proj. 319-032)
(AD-749101; MSC-1866; TR-10) Avail: NTIS CSCL 14/2

The authors calculate the effect of thermal fluctuations on the distribution of values of external flux at which a small superconducting ring closed with a Josephson junction undergoes transitions between fluxoid quantum states. This configuration provides the basis for the superconducting quantum flux detector (SQUID). GRA

N73-13459# Teledyne Gurley, Troy, N.Y.
PHOTOGRAMMETRIC TEST STANDARD Final Report, Jul. 1970 - Oct. 1971
Ralph D. Geiser Griffiss AFB, N. Y. RADC Aug. 1972 63 p refs
(Contract F30602-70-C-0260)
(AD-749502; RADC-TR-72-197) Avail: NTIS CSCL 08/2

The design of these Photogrammetric Test Standards evolved from results obtained with experimental test devices prepared under contract AF30 (602)4369-FSC-A7D2. The same basic 9 inch by 9 inch format was used and two pairs of plates were produced. The area of each plate was first divided into 9 cells of 3 inch by 3 inch size. On these test standards, each cell is repeated 3 times at each of 3 density levels. On the background plates, 3 other density levels occupy 3 different areas, each 3 inches by 9 inches in extent. When the background plate has been combined with the image plate, each cell appears at 9 different density levels. In each of the test standards, the individual cell is divided into 9 sub cells. Each sub cell is 1 inch square and each carries a specific type of information, such as resolution targets, fiducial marks, sine wave patterns, etc. Each 1 inch square sub cell is further subdivided into 9 pattern areas. Each pattern area is 8 millimeters square. These typically are 9 Ronchi rulings of different frequencies, 9 different fiducial marks of basically the same size, etc. This provides a total of 729 test areas per plate. Author (GRA)

N73-13615 Joint Publications Research Service, Arlington, Va.
CONSIDERATION OF THE INSTRUMENT INERTIA WHEN MEASURING THE AIR TEMPERATURE
L. L. Braginskaya *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 95-103 refs (For availability see N73-13602 04-20)

N73-13842* Mississippi State Univ., State College.
A DATA ACQUISITION SYSTEM (DAS) FOR MARINE AND ECOLOGICAL RESEARCH FROM AEROSPACE TECHNOLOGY
Richard A. Johnson *In* NASA. Marshall Space Flight Center

Space for Mankind's Benefit 1972 p 149-153 refs (For availability see N73-13829 04-30)
(Grants NGL-25-001-028; NGL-25-001-032; NGL-25-001-040)
CSCL 14B

N73-13524 Joint Publications Research Service, Arlington, Va.
HIGH-CAPACITY EQUIPMENT FOR PRESSING AND GAUGING OF STRUCTURAL PARTS
Ya. S. Goldman, V. V. Polivanov, S. V. Bronin, T. O. Baskakov, and G. A. Grankin *In its* Metal-Ceram. Struct. Mater. 10 Nov. 1972 p 44-47 (For availability see N73-13515 04-17)

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N73-13460 National Lending Library for Science and Technology, Boston Spa (England).
A STUDY OF THE CONDITIONS FOR DEPOSITION OF ALUMINIUM AND SILICON HYDROXIDES IN TiO2 SURFACES
I. P. Sorokin, N. N. Stremilova, T. A. Yermolaeva, V. I. Milko, L. A. Gavrilova, and A. I. Kolomeets Oct. 1972 7 p refs Transl. into ENGLISH from Lakokrasoch. Mater. Ikh Primen. (USSR), no. 6, 1971 p 19-21
(NLL-RTS-7638) Avail: Natl. Lending Library, Boston Spa, Engl.: £0.60; 2 NLL photocopy coupons

The optimum conditions for uniformly covering TiO2 particles were investigated. The degree of precipitation of the aluminum and silicon hydroxide was investigated as a function of the temperature, the value of the alkaline modulus of the solution, and the flow rate of carbon dioxide. The experiments were performed in a reaction glass with bubbling carbon dioxide and with intensive agitation. The carbonization process was monitored by measuring the pH of the solution. Author

N73-13461 National Lending Library for Science and Technology, Boston Spa (England).
INTERACTION BETWEEN METAL AND POLYAMIDE SURFACES IN ROTATING FRICTION
U. A. Bely, B. I. Kupchynau, and P. V. Sysoeu Oct. 1972 9 p refs Transl. into ENGLISH from Vestsi Akad. Navuk, Belarusk. SSR, Ser. Fiz.-Tekh. Navuk (Minsk), no. 1, 1967 p 94-99
(NLL-RTS-7378) Avail: Natl. Lending Library, Boston Spa, Engl.: £0.80; 3 NLL photocopy coupons

The influence of microgeometry on the dry friction properties of metals interacting on polyamide surfaces was investigated. Data cover the average height of microhardness at which the stresses under the tops of the ridges remain below the hardness limit of the polymer material. Determinations were also made of the optimum surface finish for the metallic member. E.H.W.

N73-13462* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
GAS FLOW CONTROL DEVICE Patent
John B. Wellmann, inventor (to NASA) Issued 24 Oct. 1972 5 p Filed 10 Aug. 1971 Supersedes N72-20459 (10 - 11, p 1481) Sponsored by NASA
(NASA-Case-NPO-11479; US-Patent-3,700,005; US-Patent-Appl-SN-170440; US-Patent-Class-137-608; US-Patent-Class-137-81.5; US-Patent-Class-251-122; US-Patent-Class-138-45) Avail: US Patent Office CSCL 13K

A gas flow control device is disclosed comprising a housing with an input port through which gas enters. At the input port, the subsonic gas flow is converted into supersonic flow. The housing includes a movable probe with a conical external surface which produces a shock wave when impinged by the supersonic gas flow. The probe has a cavity with a shape of a truncated cone with the top of the cone serving as the cavity input. Mounted in the housing and surrounded by the probe is a mandrel with a truncated cone-shaped top, whose surface corresponds to the cavity surface. By moving the probe toward and away from the input port, the rate of gas flowing to an output port is controlled. The shock wave prevents disturbances due to changes in the gas flow rate from advancing upstream.
Official Gazette of the U.S. Patent Office

N73-13463* McDonnell-Douglas Co., Huntington Beach, Calif.
VARIABLE DIRECTION FORCE COUPLER Patent
William H. Hespenhide, inventor (to NASA) Issued 24 Oct. 1972 4 p Filed 28 Aug. 1970 Supersedes N72-20456 (10 - 11, p 1481) Sponsored by NASA
(NASA-Case-MFS-20317; US-Patent-3,699,799; US-Patent-Appl-SN-67730; US-Patent-Class-72-447; US-Patent-Class-72-476; US-Patent-Class-173-131) Avail: US Patent Office CSCL 13E

A variable direction force coupler is used for transmitting a reciprocating force along a selectable curved path. It consists of a flexible tube filled with rigid balls and force transmission members at each end connecting the coupler between an applied force and a body to receive the force.
Official Gazette of the U.S. Patent Office

N73-13464* Boeing Co., Seattle, Wash.
EXTRUSION CAN Patent
James G. Hunt and Roy W. Rice, inventors (to NASA) Issued 17 Oct. 1972 5 p Filed 29. Mar. 1971 Supersedes N71-34428 (09 - 21, p 3433) Sponsored by NASA
(NASA-Case-NPO-10812; US-Patent-3,698,848; US-Patent-Appl-SN-129073; US-Patent-Class-425-176; US-Patent-Class-425-113; US-Patent-Class-425-133; US-Patent-Class-72-258) Avail: US Patent Office CSCL 13I

An extrusion can is used for extruding ceramics under heat and pressure, characterized by a metallic, tubular wall defining a cylindrical body adapted to receive a ceramic billet. A feature of the extrusion can resides in multiple pairs of adjacent surfaces defining within the tubular wall a plurality of elongated slots extending substantially the length of the body.
Official Gazette of the U.S. Patent Office

N73-13465* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF FORMING SUPERALLOYS Patent
John C. Freche, William J. Waters, and Richard L. Ashbrook, inventors (to NASA) Issued 14 Nov. 1972 4 p Filed 20 Apr. 1970 Supersedes N70-41577 (08 - 23, p 4333)
(NASA-Case-LEW-10805-1; US-Patent-3,702-791; US-Patent-Appl-SN-29917; US-Patent-Class-148-11.5R) Avail: US Patent Office CSCL 13H

A highly alloyed material obtained using prealloyed powders is easily shaped at high temperatures if it becomes superplastic. Subsequent heat treatments restore the ability of the material to resist deformation at high temperatures.
Official Gazette of the U.S. Patent Office

N73-13466* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REDUNDANT HYDRAULIC CONTROL SYSTEM FOR ACTUATORS Patent
Richard A. Campbell, inventor (to NASA) Issued 14 Nov. 1972 7 p Filed 1 Jun. 1971 Supersedes N71-34426 (09 - 21, p 3433)
(NASA-Case-MFS-20944; US-Patent-3,702,575; US-Patent-Appl-SN-148756; US-Patent-Class-91-363A; US-Patent-Class-91-448) Avail: US Patent Office CSCL 13K

A combination of three main valves to supply hydraulic pressure to a conduit pattern is described, including four secondary valves for the assured operation of a hydraulic actuator. All the secondary valves are under the command of a comparator and logic controller which is capable of stopping the hydraulic flow from a valve that failed and allowing the hydraulic flow to continue with the other operative valves. The control system permits two single point failures and still allows operation with no degradation in performance. Official Gazette of the U.S. Patent Office

N73-13467* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ELECTROLYTIC GAS OPERATED ACTUATOR Patent
Peter G. Simmonds, inventor (to NASA) Issued 14 Nov. 1972 5 p Filed 29 Mar. 1971 Supersedes N71-34419 (09 - 21,

p 3432) Sponsored by NASA
(NASA-Case-NPO-11369; US-Patent-3,702,532; US-Patent-Appl-SN-129072; US-Patent-Class-60-23; US-Patent-Class-60-1; US-Patent-Class-60-37) Avail: US Patent Office CSCL 13I

An actuator incorporating an electrolytic gas generator-evacuator is disclosed. A membrane of material selectively permeable to a drive gas is inserted in a combined inlet-outlet of an expandable chamber. The membrane forms a portion of an electrolytic cell by being immersed in a body of electrolyte capable of transporting an ionic species of the drive gas between the membrane as one electrode and a counter electrode. By connecting the combined inlet-outlet of the chamber to the outside surface of the membrane and cyclically driving the electrolytic cell in a drive gas generation mode and a drive gas evacuation mode, the chamber will cyclically expand and contract.
Official Gazette of the U.S. Patent Office

N73-13468*# Aerospace Corp., El Segundo, Calif. Vehicle Engineering Div.
EMPIRICAL EVALUATION OF PUMP INLET COMPLIANCE Final Report
F. G. Ghahremani and S. Rubin Jul. 1972 89 p refs
(Contract NAS8-27731)
(NASA-CR-123963; ATR-73(7257)-1) Avail: NTIS HC $6.50 CSCL 13K

Cavitation compliance was determined experimentally from pulsing tests on a number of rocket turbopumps. The primary test data used for this study are those for the Rocketdyne H-1, F-1, and J-2 oxidizer and fuel pumps employed on Saturn vehicles. The study shows that these data can be correlated by a particular form of nondimensionalization, the key feature of which is to divide the operating cavitation number or suction specific speed by its value at head breakdown. An expression is obtained for a best-fit curve for these data. Another set of test data for the Aerojet LR87 and 91 pumps can be correlated by a somewhat different nondimensional pump performance parameter, specifically by relating the cavitation number to its position between the head breakdown point and the point of zero slope of the head coefficient versus cavitation number. Recommendations are given for the estimation of the cavitation compliance for new designs in the Rocketdyne family of pumps. Author

N73-13469# National Aerospace Lab., Tokyo (Japan).
STUDY ON THE PERFORMANCE OF BALL BEARINGS AT HIGH dn VALUES
Yukio Miyakawa, Katsumi Seki, and Masayuki Yokoyama May 1972 120 p refs In JAPANESE; ENGLISH summary
(NAL-TR-284) Avail: NTIS HC $8.00

Experiments were conducted to investigate the limiting dn values and the running performance of two deep-groove ball bearings equipped with an outer-race-riding cage and an inner-race riding cage respectively, and an angular contact ball bearing operating with dn values ranging between 0.3 million and 3 million. Test bearings were rotated by an air turbine of 15.5 PS at 100,000 rpm. As for the bearing load, a thrust load only was exerted and was varied from 25 to 200 kg. Turbo-oil of mineral oil base was used to lubricate the test bearing and temperature of the inlet oil was varied from 30 to 120 C. Oil was supplied to the bearing by a single nozzle and the flow was varied from 0.22 to 3 kg/min. Oil jet velocity was constant at about 20 m/s, irrespective of the oil flow. The results obtained in the experiments are given. Author

N73-13470# National Aerospace Lab., Tokyo (Japan).
STUDY ON LEAD MONOXIDE AS A SOLID LUBRICANT FOR HIGH TEMPERATURES
Yukio Miyakawa, Makota Nishimura, and Wataru Abe May 1972 58 p refs In JAPANESE; ENGLISH summary
(NAL-TR-285) Avail: NTIS HC $5.00

A study of the friction, wear and endurance life of lead monoxide (PbO) was made in room air, in controlled atmospheres and in vacuum at high temperatures up to 800 C. Also, studies were made to determine the lead monoxide coating procedure on stainless steel. A cylindrical rider was rubbed with a rotating disk, at sliding velocities from 0.01 m/s to 3 m/s. The rider specimen was tool steel and the disks were austenic stainless steel and pure metals of Fe, Ni, Cu, and Al. The lubricating properties of PbO of the layer made on the surface of a rotating disk and the PbO pellet were examined. An analysis of the results obtained is presented. Author

N73-13471*# Avco Lycoming Div., Stratford, Conn.
DESIGN STUDY OF AN AIR PUMP AND INTEGRAL LIFT ENGINE ALF-504 USING THE LYCOMING 502 CORE
Dale Rauch Jul. 1972 172 p
(Contract NAS3-15696)
(NASA-CR-120992; Lycoming-105.22.21) Avail: NTIS HC $10.75 CSCL 13I

Design studies were conducted for an integral lift fan engine utilizing the Lycoming 502 fan core with the final MQT power turbine. The fan is designed for a 12.5 bypass ratio and 1.25:1 pressure ratio, and provides supercharging for the core. Maximum sea level static thrust is 8370 pounds with a specific fuel consumption of 0.302 lb/hr-lb. The dry engine weight without starter is 1419 pounds including full-length duct and sound-attenuating rings. The engine envelope including duct treatment but not localized accessory protrusion is 53.25 inches in diameter and 59.2 inches long from exhaust nozzle exit to fan inlet flange. Detailed analyses include fan aerodynamics, fan and reduction gear mechanical design, fan dynamic analysis, engine noise analysis, engine performance, and weight analysis. Author

N73-13472# La Plata Univ. (Argentina). Dept. of Aeronautical Engineering.
FABRICATION OF MINIATURE FLUIDIC COMPONENTS FOR AN INTEGRATION SYSTEM [FABRICACION DE COMPONENTES FLUIDICOS MINIATURA. INTEGRACION DE SISTEMAS]
Oscar A. Szakalicki 1972 15 p refs In SPANISH
Avail: NTIS HC $3.00

A method is presented for fabricating miniature fluidic elements using photochemical engraving. The experimental procedures, equipment, and results obtained with copper, bronze, and stainless steel are described. The assembly is described of the silhouette, interconnecting, and mounting plates for photoengraving to obtain elements for analog and logical functions in miniaturized integration systems. Transl. by F.O.S.

N73-13473# Joint Publications Research Service, Arlington, Va.
CAST SPIDER'S WEB (DEVELOPMENT OF MICROWIRE)
Vanda Beletskaya 1 Dec. 1972 9 p Transl. into ENGLISH from Ogenek (Moscow), Sep. 1972
(JPRS-57655) Avail: NTIS HC $3.00

The history of the development and technology of microwire casting in the U.S.S.R. is reported. Author

N73-13474*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LIGHT SHIELD AND COOLING APPARATUS Patent Application
Thomas G. Meador, Jr., inventor (to NASA) Filed 10 Nov. 1972 9 p
(NASA-Case-LAR-10089-1; US-Patent-Appl-SN-305638) Avail: NTIS HC $3.00 CSCL 20F

A light shield and cooling apparatus for a high intensity ultraviolet lamp are described. Liquid and high pressure air are utilized as coolants. The shielding apparatus confines the intense light to a desired area and suppresses the noise created by the high pressure air. D.L.G.

N73-13475*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
EMERGENCY MASTER CONTROL VALVE Patent Application
William G. Lewers, inventor (to NASA) Filed 8 Dec. 1972 13 p
(NASA-Case-WLP-10040-1; US-Patent-Appl-SN-313390) Avail: NTIS HC $3.00 CSCL 13K

An improved tank heater is described for lowering the viscosity of liquids stored in tanks and for isolating the liquid such that the tank heater coils can be removed and repaired without having to drain the tank. NASA

N73-13476# Joint Publications Research Service, Arlington, Va.

ELECTRON-BEAM WELDING IN VARIOUS SPATIAL SITUATIONS
B. Ye. Paton, O. K. Nazarenko, V. Ye. Lokshin, and K. S. Akopyants 17 Oct. 1972 10 p refs Transl. into ENGLISH from Avtomat Svarka (Kiev), no. 6, 1972 p 1-4
(JPRS-57281) Avail: NTIS HC $3.00

The effect of the orientation of the joint relative to the course of gravity during electron-beam welding of metals is examined. Author

N73-13477# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
SINTERING OF URANIUM DIOXIDE: INHIBITION OF DENSIFICATION BY DEVELOPMENT OF GAS PRESSURE IN PORES Ph.D. Thesis - Paris Univ.
Bernard Francois Apr. 1972 98 p refs In FRENCH
(CEA-R-4285) Avail: AEC Depository Libraries

Studies were made on the sintering behavior of high specific surface UO2 powder compacts under hydrogen atmosphere, with special emphasis on the role of the rate of temperature increase from room temperature to 1600 C. It was found that: by a highspeed heating cycle, the main part of the initial porosity may be removed during the heating period, i.e., in less than 10 minutes; if the green density exceeded 50 per cent T. D., the densification was stopped as soon as the sample reached 1600 C; this behavior was correlated with the occurrence of a peculiar microstructure in which the pores were polyhedral in shape and located at the grain boundaries. In these pores, entrapped gases originating from powder impurities, and whose pressure was about 10 atm., inhibited any further increase in density. A similar behavior was also observed in the case of tungsten. Thus such kinds of phenomena may occur quite frequently for the sintering of metals and ceramic compounds. Author (NSA)

N73-13478# Louvain Univ. (Belgium). Inst. des Fabrications Mecaniques.
NUMERICAL CONTROL OF MACHINE TOOLS BY COMPUTER [LA COMMANDE NUMERIQUE DES MACHINES-OUTILS PAR ORDINATEUR DE PROCESSUS]
Jean Plas (Centre de Rech. Sci. et Tech. de l'Ind. des Fabric. Metal.) Brussels Centre de Rech. Sci. et Tech. de l'Ind. des Fabric. Metal. Sep. 1972 26 p refs In FRENCH Sponsored by IRSIA
(CRIF-MC-44) Avail: NTIS HC $3.50

The advantages and disadvantages of computerized numerical control, and direct numerical control of machine tools, are analyzed. For a computerized numerical control system, a small computer (4K) is sufficient, and the necessary equipment is relatively inexpensive. The principal advantage of a direct numerical control system is increased production due to reduction of stoppage time. However, a greater initial investment is necessary because of the need for a computer with a large storage capacity as well as visualization and interface equipment. The problem of correction and optimization of programs and data is also discussed. Author (ESRO)

N73-13479# Deutsche Forschungs- und Versuchsanstalt fuer luft- und Raumfahrt, Porz (West Germany). Inst. fuer Luftstrahlantriebe.
MODEL TESTS FOR THE BOUNDARY LAYER BEHAVIOR OF EFFUSION COOLED TURBINE BLADES [MODELLVERSUCHE ZUM GRENZSCHICHTVERHALTEN AN EFFUSIONSGEKUEHLTEN TURBINENSCHAUFTELN]
H. Kruse 1972 18 p refs In GERMAN Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-59) Avail: NTIS HC $3.00

Velocity and temperature profiles of the boundary layer on an effusion cooled turbine blade were investigated as a function of the discrete hole distribution of a model. In certain ranges, limited by the geometrical hole distribution and the blowing volume, the observed boundary layer phenomena are similar to those observed for porous walls. Deviations are observed especially near the wall; there the three-dimensional character of the flow, with local over speed normal to the wall, dominates. This effect increases with higher local exit velocities, i.e. with smaller holes and larger blowing volumes. In this case the results deviate strongly from those of a porous wall. Author (ESRO)

N73-13480# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROJECTION OF THE RESEARCH REQUIREMENTS IN THE USSR: RESULTS OF A STUDY TOUR
H. Sossenheimer 11 May 1972 19 p refs Transl. into ENGLISH from Schweissen Schneiden (West Germany), no. 1, 1971 p 5-8
(AD-747834; FTD-HT-23-2-72) Avail: NTIS CSCL 13/8

The strong interest of the Soviet Union in the technological advances that have been achieved in West Germany and the repeated visits of leading Soviet representatives in West Germany reaffirm the desire for scientific cooperation. It is shown that the attempts in the field of scientific research in welding engineering are being greatly intensified. GRA

N73-13481# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
AIRCRAFT CLUTCH ASSEMBLIES, RAMP ROLLER Final Report
Jules G. Kish Jul. 1972 97 p refs
(Contract DAAJ02-71-C-0026; DA Proj. 1G1-62207-AA-72)
(AD-747816; SER-50767; USAAMRDL-TR-72-31) Avail: NTIS CSCL 13/9

The results of a 12-month program to evaluate a ramp roller clutch operating at engine input conditions of 26,500 rpm and 1500 hp are contained herein. The purpose of this design, manufacture, and test program was to evaluate clutch operation at the high speeds of advanced technology engines. The ramp roller clutch was designed using the most advanced state-of-the-art technology available. Several new features were added to enhance high-speed operation. The most outstanding results were obtained from hollow rollers, which were used for the first time in a ramp roller clutch. Author (GRA)

N73-13482# Battelle Columbus Labs., Ohio.
FRICTION WELDING OF MISSILE SYSTEMS HARDWARE Final Technical Report
David Aj Seifert, Kenneth E. Meiners, and Hugh D. Hanes Aug. 1972 148 p refs
(Contract DAAH01-71-C-0142)
(AD-747838) Avail: NTIS CSCL 16/4

The report summarizes the program to establish cost-effectiveness criteria and to develop parametric data for friction welding of missile-systems hardware. A cost-effectiveness criteria checklist and summary of friction weldable materials are provided. Empirical models governing friction welding of thin-walled maraging steel structures were developed. Metallurgical, mechanical, and geometric aspects of friction welding 18Ni(250) maraging steel and 7075-T6 aluminum tubes are discussed. Mechanical property, friction-welding parameter, and thermal-history data are presented. Author (GRA)

N73-13483# North American Rockwell Corp., Los Angeles, Calif.
EFFECTS OF THERMOMECHANICAL TREATMENTS ON ALUMINUM ALLOYS Final Technical Report, 1 Mar. 1969 - 1 Jul. 1971
A. W. Sommer, N. E. Paton, and D. G. Folgner Wright-Patterson AFB, Ohio AFML Feb. 1972 99 p refs
(Contract F33615-69-C-1422; AF Proj. 7353)
(AD-748361; NA-71-1087; AFML-TR-72-5) Avail: NTIS CSCL 13/8

The effects produced by thermomechanical treatments on the mechanical, microstructural, and stress corrosion resistance properties of 2024, 7049, and 7075 aluminum alloys were investigated. These properties are compared with those obtained in the standard commercial tempers. The optimum benefits of thermomechanical processing are obtained when the material has previously been heat treated to its maximum age-hardenable condition. A thermomechanical response is developed with as little as 5 percent mechanical deformation. The uniformity of this plastic strain throughout the entire mass of the material is a critical factor. This mechanical deformation is carried out at a temperature high enough to develop a homogeneous random distribution of dislocations and to stabilize this configuration by precipitation along a portion of their lengths. The optimum temperature for a postdeformation heat treatment to produce the necessary resistance to stress corrosion cracking is just above the Guinier-Preston zone solvus for the hardening phase. Author (GRA)

N73-13484# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A STUDY OF THE MECHANICAL PROPERTIES OF METALS FORMED BY REGULAR AND HIGH-SPEED FORGING
M. P. Shevchenko, L. D. Sokolov, V. M. Solenov, D. I. Shetulov, S. I. Ishutkin, V. A. Skudnov, V. A. Krokha, and A. N. Gladkikh 9 Jun. 1972 19 p refs Transl. into ENLGISH from Eksp. Nauch.-Issled. Inst., Razrab. Issled. Tekhonol. Protsessov Obrabotki Metalloy Davleniem (USSR), no. 19, 1968 p 84-94
(AD-748710; FTD-MT-24-1925-71) Avail: NTIS CSCL 13/8

The article reports on the nature and results of tests conducted on aluminum alloy AMTs-AM to determine whether such mechanical properties as yield point, tensile strength, and fatigue limit are affected by the type of forging used in preparing the specimens (regular forging and explosive forming). It was found that: (1) In explosive forming, strength characteristics are higher but ductility is lower than with regular forging, (2) an especially noticeable difference is observed at low temperatures, (3) fatigue strength with explosive forming is higher, (4) the time of aging of the material also affects the mechanical properties. Author (GRA)

N73-13485# Army Foreign Science and Technology Center, Charlottesville, Va.
FRICTION, LUBRICATION AND WEAR IN MACHINERY
Boris Ivanovich Kostetskii 15 Aug. 1972 503 p refs Transl. into ENGLISH of the book "Trenie, Smazka i Iznos v Mashinakh" Kiev, Izdatelstvo Tekhnika, 1970
(AD-749086; FSTC-HT-23-1024-72) Avail: NTIS CSCL 11/9

Practical experience is generalized, wide-scale experimental materials are systematized and the principal theoretical principles for problems of friction, lubrication, and wear in machinery are set forth. A classification is given and physical models of the friction, wear, and damage processes are constructed. Systems of lubrication, types of lubricating materials, and the principles of action thereof are examined. Experimental and analytical rules for friction and wear are presented. Normal and patholic phenomena are defined. Rules for processes of external friction, lubricating action, and wear in connection with a change in the geometric characteristics of surfaces, material properties, surface processing methods, and friction service conditions are examined. Author (GRA)

N73-13486# Army Construction Engineering Research Lab., Champaign, Ill.
THE EXAMINATION OF DISCONTINUITIES IN WELDS BY STEREORADIOGRAPHY
K. W. Carlson and F. V. Lawrence Sep. 1972 18 p refs
(DA Proj. 4A0-62112-A-891)
(AD-749459; CERL-TR-M-24) Avail: NTIS CSCL 13/5

Since welds are rarely defect-free, it is desirable to quantify the effects of defects on the mechanical properties of welds and to develop a field inspection procedure more reliable, more complete, faster, and less costly than that currently in use. This investigation of the feasibility and practicability of stereoradiography was to satisfy the latter objective. Stereoradiography, unlike normal incidence radiography or ultrasonic inspection, permits direct three-dimensional observation of internal flaws. Stereoradiography entails obtaining an X-ray exposure at two known positions of the object with respect to the X-ray tube and viewing the stereo-pair through a stereo-viewer (stereoscope). By accurately measuring the parallax differences resulting from the specimen (or X-ray tube) shift, one may calculate the weld flaw's depth below the plate surface using photogrammetric principles. To evaluate this technique, ten pores in a defective weldment were measured at three different times. The results were compared to determine how well an observer could reproduce his measurements. The weld was sectioned, and the actual pore depths were measured directly. These results were compared to the stereoradiographically-measured depths to determine the accuracy of the technique. Author (GRA)

N73-13487# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF THE STRENGTH OF WELDED CONSTRUCTIONS
G. A. Nikolaev, S. A. Kurkin, V. A. Vinokurov, V. M. Sagalevich, and I. I. Makarov 4 Aug. 1972 21 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Mashinostr. (Moscow), no. 9, 1968 p 144-153
(AD-749529; FTD-MT-24-10-72) Avail: NTIS CSCL 13/5

The paper deals with the background of the development of welding technology. These developments include the determination of temperature and residual stresses and deformations caused by the welding process. The following are stressed: (1) methods for elimination of displacements from welding in shells; (2) strength of welds with heterogeneous joint; (3) study of mechanical properties under conditions of biaxial elongation; (4) strength of welds at low temperatures. GRA

N73-13488# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON THE PROBLEM OF TRANSIENT MOTION OF SELF OSCILLATING SYSTEMS WITH DRY FRICTION
S. V. Baev 29 Jun. 1972 20 p refs Transl. into ENGLISH from Issled. po Teorii Kolebanii i Dinam. Mostov (USSR), no. 73, 1968 p 61-71
(AF Proj. 7343)
(AD-749521; FTD-HT-23-815-72) Avail: NTIS CSCL 20/11

An examination is made of the problem of the movement of a solid with a rigid connection over a dry surface. The length of the connection is variable in time. The dependence of sliding friction on the velocity is nonlinear. Weak nonlinearity of the system is assumed. The force of static friction depends on the time of nonmoving contact. Equations are formulated for the segment relative to movement and rest. The equation relative to movement is solved by methods of successive approximations and by variable scaling. The condition of the existence of stops is presented. A determination is made of the period of vibrations with stops. The equation relative to movement for a concrete series of parameters is solved numerically using a digital computer and is compared with an analytical method. Author (GRA)

N73-13519 Joint Publications Research Service, Arlington, Va.
INVESTIGATION AND DEVELOPMENT OF NEW METHODS OF FABRICATING PARTS OF MOLDS AND STAMPS FROM METAL POWDERS
V. P. Severdenko, M. Ya. Kutser, Ye. V. Zvonarev, and V. N. Bulakh *In its* Metal-Ceram. Struct. Mater. 10 Nov. 1972 p 15-22 (For availability see N73-13515 04-17)

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N73-13489* Smithsonian Astrophysical Observatory, Cambridge, Mass.
ATOMIC HYDROGEN MASER WITH BULB TEMPERATURE CONTROL TO REMOVE WALL SHIFT IN MASER OUTPUT FREQUENCY Patent
Robert F. C. Vessot and Martin W. Levine, inventors (to NASA) Issued 14 Nov. 1972 7 p Filed 23 Sep. 1971 Supersedes N72-21502 (10 - 12, p 1620) Sponsored by NASA
(NASA-Case-HQN-10654-1; US-Patent-3,702,972; US-Patent-Appl-SN-182978; US-Patent-Class-331-94; US-Patent-Class-324-.5R) Avail: US Patent Office CSCL 20E

An atomic hydrogen maser is disclosed having automatic control of bulb temperature so as to eliminate the frequency shift due to collision of atomic hydrogen with the storage bulb walls. The storage bulb volume is changed by using a flexible bulb and the frequency of the output from the maser is measured for at least two different surface-to-volume configurations. An output frequency difference signal, measured during each cycle is used to control the bulb temperature, so that when the proper temperture is attained, a zero difference in frequency between operation at minimum volume and maximum volume is obatined. Official Gazette of the U.S. Patent Office

N73-13490*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOS-1 LASER PULSE RETURN SHAPE ANALYSIS
T. L. Felsentreger Sep. 1972 43 p

(NASA-TM-X-66123; X-553-72-354) Avail: NTIS HC $4.25 CSCL 20E

An attempt has been made to predict the shape of the laser return pulse from the corner cube retroreflectors on the GEOS-1 spacecraft. The study is geometrical only, and neglects factors such as optical interference, atmospheric perturbations, etc. A function giving the intensity of the return signal at any given time has been derived. In addition, figures are given which show the predicted return pulse shape as a function of time, the angle between the beam and the spin axis, and an in-plane angle (designating the orientation of the intersection of the planar waves with the plane of the corner cubes). Author

N73-13491# Institute of Nuclear Research, Warsaw (Poland).
SCATTERING OF LASER LIGHT FROM A MARGINALLY STABLE HYDROGEN PLASMA
Eryk Infeld, Andrzej Skorupski, and Wladyslaw Zakowicz 1972 13 p refs
(INR-P-1377) Avail: AEC Depository Libraries

In recent experiments, light was scattered from hydrogen plasmas in which the electron component was drifting relative to the ion component. A lack of precise knowledge of the drift velocity corresponding to marginal stability, as well as of what is to be expected when marginal stability is reached, led to a certain amount of vagueness in interpreting these experiments. The present work gives an exact division of parameter space into stable and unstable regions. The dividing line in the space of T sub plus over T sub minus versus V sub d over V sub the is seen to have two segments, for which the wave number that becomes unstable first is nonzero. The values of the critical wave numbers are given. An error often made in calculating the scattered spectrum near marginal stability is pointed out.
Author (NSA)

N73-13492# Bendix Corp., Kansas City, Mo.
LASER INTERFEROMETER SCALING COUNTER
L. D. Wonnell May 1972 35 p refs
(Contract AT(29-1)-613)
(BDX-613-703) Avail: NTIS

A scaling counter for use as a laser interferometer readout system is described. This counter is designed to operate with laser interferometers to achieve improved length measurement capabilities. The scaling function of the counter provides a direct readout of linear displacement in inches, meters, or any other linear unit, thereby eliminating the need for manual calculations or use of a computer for unit conversion. Readout in fringes is also available. Built-in options include preset display, polarity selection, buffered binary coded decimal (BCD) output, oscilloscope interpolation filter, and system alignment meter. Linear and transistor-transistor logic (TTL) digital integrated circuits (IC's) were utilized in the development of the counter to achieve desired capabilities, simplicity of design, and compact size. Author

N73-13493# Sandia Labs., Albuquerque, N.Mex.
DYE LASER TUNING USING PLZT CERAMICS IN BIREFRINGENT FILTERS
S. G. Varnado and W. D. Smith Jun. 1972 28 p refs Sponsored by AEC
(SC-RR-720273) Avail: NTIS

The feasibility of using lead lanthanum zirconate titanate (PLZT) ceramics as intracavity tuning elements in a rhodamine 6G dye laser was investigated. The electrooptic properties of ceramics of compositions 9/65/35 and 12/40/60 were used to form variable birefringent filters. Equations governing the operation of these filters are presented. Calculations based on the expected properties of the PLZT material indicate that tunable laser emission of very narrow spectral bandwidth (0.5nm) should be obtainable. Because of difficulties in fabricating long samples of the material and a previously undiscovered scattering phenomenon, the measured laser bandwidths were larger (2 nm to 12 nm) than anticipated. Experimental results indicate that the center wavelength of the laser can be varied from 575 nm to 587 nm by changing the voltage applied to the 9/65/35 ceramic used here. The experimental results are reconciled with the theoretical predictions by using the measured value of birefringence in the governing equations. Author

N73-13494# Addis Translations International, Woodside, Calif.
VACUUM-ULTRAVIOLET AND X-RAY LASERS
A. G. Molchanov 1972 20 p refs Transl. into ENGLISH from Usp. Fiz. Nauk. (Moscow), v. 106, no. 1, Jan. 1972 Sponsored by AEC Prepared for Sandia Labs., Albuquerque, N. Mex.
(SC-T-722513) Avail: NTIS

Amplification and generation of electromagnetic radiation at a wavelength of about 1760 A through excitation of condensed xenon by a beam of fast electrons are reported, and a recorded radiation gain in electron vibrational transitions of the hydrogen molecule in the 1567-1613 A band in a gaseous electric discharge is described. Both in the case of the condensed xenon and in that of the hydrogen molecule, transitions were used in which the minimum on the potential curve of the upper excited state did not coincide with the minimum on the potential curve of the lower ground state, which resulted in relatively easy attainment of an inverse population and, with a sufficiently high rate of upper-level excitation, resulted also in a radiation gain. The processes producing the laser effects are fundamentally different in the two cases, and are analyzed separately. Author

N73-13495# Sandia Labs., Albuquerque, N.Mex. Criteria and Heat Transfer Div.
TWO-DIMENSIONAL THERMAL ATTENUATION OF A LASER PULSE IN A SOLID
A. B. Donaldson Jun. 1972 20 p refs Sponsored by AEC
(SC-DR-720393) Avail: NTIS

The transient, two-dimensional temperature field induced in both a semi-infinite solid and a slab by an instantaneous disk pulse of energy at a surface is developed. The analysis utilizes decomposition of the problem into radial and axial components, which allows treatment of anisotropic materials. The radial temperature component is expressed in terms of the circular coverage function. Author (NSA)

N73-13496# Eastman Kodak Co., Rochester, N.Y. Apparatus Div.
INFRARED DYE LASER STUDY Final Report, Sep. 1971 - Sep. 1972
Julian P. Webb and Bert E. Plourde Sep. 1972 68 p refs
(Contract DAAK02-72-C-0012; DA Proj. 1S6-63719-DK-70)
(AD-748863) Avail: NTIS CSCL 20/5

Near infrared laser action has been demonstrated for 9 Kodak organic dyes, using a linear flash lamp for excitation. The spectral region covered by these 9 dyes extends from 850 nm to at least 960 nm, with no tuning attempted so far. Output is in the kilowatt and millijoule range. In comparison with DTTC, a polymethine dye that has recently been lased under excitation by an ultra fast coaxial flash lamp, the best laser dyes from this work have over 10 times more laser output when tested under identical conditions. Author (GRA)

N73-13497# Stanford Univ., Calif. Microwave Lab.
TUNABLE OPTICAL SOURCES Final Report, 28 Jun. 1968 - 30 Jun. 1972
S. E. Harris, R. L. Byer, R. L. Herbst, R. B. Miles, and J. F. Young Jul. 1972 32 p refs
(Contract DAHC04-68-C-0048; ARPA Order 675)
(AD-748849; ML-2077; AROD-7580-10-P) Avail: NTIS CSCL 20/5

The purpose of this contract has been the study of new techniques and devices for obtaining tunable radiation across wide regions of the electromagnetic spectrum. Principal accomplishments include: the construction and demonstration of the first optical parametric oscillator operating in the 9 to 11 micrometers spectral region; and the proposal and demonstration of the first nonlinear optical technique for access to the vacuum ultraviolet. A brief technical summary of these projects and also of the iodine laser project is given. Author (GRA)

N73-13498# Naval Research Lab., Washington, D.C.
ARPA-NRL LASER PROGRAM Semiannual Technical Report, 1 Jul. - 30 Dec. 1971
Aug. 1972 37 p refs
(ARPA Order 2062)
(AD-748178; NRL-MR-2483) Avail: NTIS CSCL 20/5

The ARPA-NRL high energy laser program is concerned with

the development of laser technology in four program areas: Chemical Lasers, Electric Discharge Lasers; High Power Glass Lasers and New Laser Techniques. The report summarizes the progress made in those areas during the first half of FY 72.
Author (GRA)

N73-13499# Informatics, Inc., Rockville, Md.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, APRIL - JUNE 1972
Stuart G. Hibben 25 Aug. 1972 124 p refs
(Contract F44620-72-C-0053; ARPA Order 1622)
(AD-748258; AFOSR-72-1714TR; Rept-8) Avail: NTIS CSCL 20/5

Contents: Solid state lasers; Liquid lasers; Gas lasers; Chemical lasers; U-V lasers; Components; Nonlinear optics; Spectroscopy of laser materials; Ultrashort pulse generation; Crystal growing; General laser theory; Biological effects; Communications; Computer technology; Holography; Instrumentation and measurements; Materials processing; Plasma generation and diagnostics.
GRA

N73-13500# Aerospace Corp., El Segundo, Calif. Lab. Operations.
RESALE-2, CO2, AND INHALE
George Emanuel and W. Dallas Adams 25 Aug. 1972 77 p refs
(Contract F04701-72-C-0073)
(AD-748293; TR-0073(3430)-4; SAMSO-TR-72-210) Avail: NTIS CSCL 20/5

The report describes three alterations to the RESALE computer program. First, computer code RESALE-2 is described. This new code determines spectrally the radiative power from a gas into a detector or monochromator. The gas may have arbitrary optical thickness with either positive or negative gain, and the spectral lines may have a Voigt profile. Second, data and their sources are presented for the spectroscopic and line broadening constants required for a RESALE-1 calculation of lasing power on the 10.6 micrometer band of CO2. Finally, computer code INHALE is described. This new input routine greatly simplifies the use of the RESALE program.
Author (GRA)

N73-13501# Ohio State Univ., Columbus. ElectroScience Lab.
LASER ABSORPTION IN THE 5 MICRON BAND Quarterly Report, 23 Dec. 1971 - 23 Mar. 1972
Dale L. Ford, F. S. Mills, and Ronald K. Long Jul. 1972 31 p refs
(Contract F30602-72-C-0016; ARPA Order 1279)
(AD-748437; ESL-3271-3; RADC-TR-72-195; QR-3) Avail: NTIS CSCL 20/5

The report describes the progress on the experimental study of atmospheric water vapor absorption at CO, HF, and DF laser frequencies using a one km White absorption cell and laser sources. Experimental data at 8 CO laser frequencies is reported which has an overall accuracy of plus or minus 5%. The design and construction of a small pulsed electric discharge HF-DF laser is described.
Author (GRA)

N73-13502# Army Electronics Command, Fort Monmouth, N.J.
ERBIUM LASER RANGEFINDING
Jack M. Strok, William C. Beattie, and Edith J. Tebo Jun. 1972 18 p
(DA Proj. 1S6-62703-A-186)
(AD-748071; ECOM-3582) Avail: NTIS CSCL 17/5

Laser rangefinding at 1.54 microns was performed with an erbium laser transmitter and Texas Instruments APD-1.54 germanium avalanche photodetector. Ranging to a 2 x 2 meter target 2635 meters away produced a usable return signal of .7 volt. Trees 3.2 km away yielded return signals of approximately .1 volt. The rangefinder weighed in excess of 50 lb, and would be difficult to adapt to a lightweight system.
Author (GRA)

N73-13503# Naval Research Lab., Washington, D.C.
A NUMERICAL CALCULATION OF THERMAL BLOOMING OF PULSED, FOCUSED LASER BEAMS
Peter B. Ulrich 30 Dec. 1971 21 p refs
(NRL Proj. R05-31)
(AD-748991; NRL-7382) Avail: NTIS CSCL 20/5

The report summarizes the development of a computer program which solves the problem of propagation of pulsed, focused laser beams in a gas. The code includes the effects of the absorbing medium by self-consistent inclusion of the detailed hydrodynamic processes. The report presents a description of the transformations of the relevant equations, a description and stability analysis of the algorithms used, a summary of the checks on accuracy and internal consistency both of the wave optics and the hydrodynamics, comparison with analytic theories, and presentation of an example of results for a typical case of interest.
Author (GRA)

N73-13504# Informatics, Inc., Rockville, Md.
SELECTED MATERIAL FROM SOVIET TECHNICAL LITERATURE, APRIL 1972
Stuart G. Hibben 7 Jun. 1972 145 p refs
(Contract F44620-72-C-0053; ARPA Order 1622-3)
(AD-749488; AFOSR-72-1924TR) Avail: NTIS CSCL 20/5

The report includes abstracts and bibliographic lists on major contractual subjects that were completed in April, 1972. The major topics are: laser technology, effects of strong explosions, geosciences, and particle beams. A section on material sciences is included as the optional fifth topic. The abstracted material includes some selections prior to 1972 that have not otherwise been reported.
Author (GRA)

N73-13505# California Univ., Santa Barbara.
FOURTH INTERNATIONAL SYMPOSIUM ON ACOUSTICAL HOLOGRAPHY Final Report
Glen Wade Aug. 1972 6 p refs Conf. held at Santa Barbara, 10-12 Apr. 1972
(Grant Nonr(G)-00001-72)
(AD-749337) Avail: NTIS CSCL 14/5

Papers presented at the Fourth International Symposium on Acoustical Holography in Santa Barbara, 10 - 12 April 1972, are summarized.
Author (GRA)

N73-13506# American Optical Co., Southbridge, Mass. Central Research Lab.
DEVELOPMENT OF SELF Q-SWITCHING GLASS LASER ILLUMINATOR HEAD Final Report, 18 Jun. 1971 - 31 Mar. 1972
Robert J. Landry Jun. 1972 53 p refs
(Contract DAAK02-71-C-0420)
(AD-749511; Rept-621-TR-F) Avail: NTIS CSCL 20/5

The Research and Development program which resulted in the development of a Nd(3+) doped Self Q-switching Glass Laser Illuminator Oscillator is described. Research studies undertaken in this program included an evaluation of some new self Q-switching glass compositions, a study of the effects of relatively high input powers on the laser output beam spread and efficiency, and a study of the temperature dependence of the characteristics of the laser self Q-switching train of spikes and efficiency over the temperature range 12C through 50C. In another study it was found that the thermal fracture point of untreated self Q-switching glass laser rods is roughly about a factor of 1.7 times less than that for the untreated conventional laser glass of similar composition. The laser illuminator oscillator developed and delivered to Fort Belvoir is described. Included is a description of the highly efficient and flexible imaging type water cooled laser cavity structure.
Author (GRA)

N73-13507# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
USE OF GALLIUM ARSENIDE CRYSTALS TO MODULATE EMISSION ON 10.6 MICROMETERS WAVELENGTH
M. M. Koblova and I. V. Nikolaev 1 Aug. 1972 9 p ref Transl. into ENGLISH from Probl. Peredachi Inform., Akademiya Nauk (USSR), 1969 p 376-382
(AD-749631; FTD-HC-23-0848-72) Avail: NTIS CSCL 20/5

An investigation was made into the transparency of high resistance specimens and the electro optical effect in them in connection with the feasibility of using GaAs crystals for modulating laser emission with a wavelength of 10.6 Mu. The results show that an IR modulator can be developed on the basis of GaAs crystals which operate at high layer power levels, in particular when cooling is used (the authors used a thermoelectric cooler). A depth of modulation of 60 to 70 percent is

achieved at a voltage with an amplitude of 1.5 kv.
Author (GRA)

N73-13508# Naval Research Lab., Washington, D.C.
THERMAL BLOOMING IN VISCOUS AND THERMALLY CONDUCTING FLUIDS Interim Report
J. N. Hayes 21 Aug. 1972 23 p refs
(RR0110741)
(AD-748994; NRL-7383) Avail: NTIS CSCL 20/5

The problem of thermal blooming of a laser beam in viscous and thermally conducting fluids is treated by means of the model discussed NRL Report 7213. (In that report blooming was treated for an ideal gas only). It is shown that viscous effects are small, as should be expected. The longtime behavior of the density in the presence of thermal conductivity is discussed at length. The cases of beam diameters of 0.5 and 1.0 cm with Gaussian intensity profiles are treated. The effect of thermal conduction in these cases is small, but in the direction of reducing the thermal blooming. For smaller diameter beams, it is shown that conductive effects are more pronounced. Author (GRA)

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N73-13509 National Lending Library for Science and Technology, Boston Spa (England).
EFFECT OF HEAT TREATMENT ON THE MAGNETIC ANISOTROPY ENERGY OF MOLYBDENUM PERMALLOY (SUPERMALLOY)
T. Yamamoto et al Nov. 1972 16 p Transl. into ENGLISH from Denki Shikensho Iho (Tokyo), v. 24, no. 7, 1960 p 528-534
(NLL-RTS-7641) Avail: Natl. Lending Library, Boston Spa, Engl.: £1.50; 5 NLL photocopy coupons

The effect of heat treatment on the magnetic properties of molybdenum permalloy is discussed. The preparation of polycrystalline materials and experimental procedures employed are presented. The change of heat treatment at different temperatures, the magnetic anisotropy constant required to achieve saturation when magnetized, and the directions of magnetization are examined. Author

N73-13510 National Lending Library for Science and Technology, Boston Spa (England).
ORDERING IN THE NICKEL-IRON SYSTEM
V. I. Gomankov, I. M. Puzei, and E. I. Maltsev Oct. 1972 6 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 14, no. 10, 1969 p 1716-1718
(NLL-RTS-7547) Avail: Natl. Lending Library, Boston Spa, Engl.: £0.50; 2 NLL photocopy coupons

Quantitative examination of the ordering in the nickel-iron system by neutron diffraction is discussed. Alloys enriched with Ni(62), which has a negative scattering amplitude, were used in the tests. The concentration dependence for the long range order of Ni3Fe type of alloy is reported. The preparation of the specimens is described and data are presented for the various conditions investigated. Author

N73-13511 National Lending Library for Science and Technology, Boston Spa (England).
INVESTIGATION OF THE EFFECTS OF ATOMIC ORDERING IN TERNARY SOLID SOLUTIONS BASED ON Ni3Fe, ALLOYED WITH ELEMENTS OF GROUP VI - CHROMIUM, MOLYBDENUM AND TUNGSTEN
I. L. Eganyan and Ya. P. Selisskii Nov. 1972 9 p refs Transl. into ENGLISH from Uporyadochenie Atomov i Ego Vliyanie na Svoistva Splavov, Ser. Metallofiz. (Kiev), no. 20, 1968 p 100-104
(NLL-RTS-7654) Avail: Natl. Lending Library, Boston Spa, Engl.: £0.80; 3 NLL photocopy coupons

Investigations of the relationships between Young's Modulus; the kinetics of ordering of alloy systems of Ni-Fe-Cr, Ni-Fe-Mo, and Ni-Fe-W; and temperature are discussed. Typical curves for the relationship between the temperature and Young's modulus and the temperature coefficient of slowly annealed alloys of Ni3Fe and Ni3(Fe,Mo) are presented. Author

N73-13512*# Grumman Aerospace Corp., Bethpage, N.Y. Materials and Structural Mechanics.
PURIFICATION KINETICS OF BERYLLIUM DURING VACUUM INDUCTION MELTING
J. L. Mukherjee (State Univ. of N. Y., Stony Brook), K. P. Gupta (State Univ. of N. Y., Stony Brook), and C. H. Li Oct. 1972 22 p refs
(Contract NAS8-27891)
(NASA-CR-123946; RM-553) Avail: NTIS HC $3.25

The kinetics of evaporation in binary alloys were quantitatively treated. The formalism so developed works well for several systems studied. The kinetics of purification of beryllium was studied through evaporation data actually acquired during vacuum induction melting. Normal evaporation equations are shown to be generally valid and useful for understanding the kinetics of beryllium purification. The normal evaporation analysis has been extended to cover cases of limited liquid diffusion. It was shown that under steady-state evaporation, the solute concentration near the surface may be up to six orders of magnitude different from the bulk concentration. Corrections for limited liquid diffusion are definitely needed for the highly evaporative solute elements, such as Zn, Mg, and Na, for which the computed evaporation times are improved by five orders of magnitude. The commonly observed logarithmic relation between evaporation time and final concentration further supports the validity of the normal evaporation equations. Author

N73-13513# National Aerospace Lab., Amsterdam (Netherlands).
FATIGUE CRACK PROPAGATION DATA FOR TITANIUM SHEET ALLOYS Interim Report
R. J. H. Wanhill, A. M. Otter, W. J. VanderVet, and F. A. Jacobs Jan. 1972 33 p refs
(NLR-TR-72005-U; ICAF-Doc-607; IR-1) Avail: NTIS HC $3.75

Environmental fatigue crack propagation in sheets of Ti-70 and mill annealed Ti-6Al-4V is discussed. The environments were dry argon, normal air, distilled water, and aqueous sodium chloride. The experimental procedure is described and graphs of data obtained are included. Author

N73-13514*# TRW Equipment Labs., Cleveland, Ohio. Materials Technology Lab.
INFLUENCE OF CREEP DAMAGE ON THE LOW CYCLE THERMAL-MECHANICAL FATIGUE BEHAVIOR OF TWO TANTALUM BASE ALLOYS Final Report
K. D. Sheffler and G. S. Doble 1 May 1972 125 p refs
(Contract NAS3-13228)
(NASA-CR-121001; TRW-ER-7592) Avail: NTIS HC $8.25 CSCL 11F

Low cycle fatigue tests have been performed on the tantalum base alloys T-111 and ASTAR 811C with synchronized, independently programmed temperature and strain cycling. The thermal-mechanical cycles applied fell into three basic categories: these were isothermal cycling, in-phase thermal cycling, and out-of-phase thermal cycling. In-phase cycling was defined as tensile deformation associated with high temperature and compressive deformation with low temperature, while out-of-phase thermal cycling was defined as the reverse case. The in-phase thermal cycling had a pronounced detrimental influence on the fatigue life of both alloys, with the life reduction being greater in the solid solution strengthened T-111 alloy than in the carbide strengthened ASTAR 811C alloy. The out-of-phase tests also showed pronounced effects on the fatigue life of both alloys, although not as dramatic. Author

N73-13515# Joint Publications Research Service, Arlington, Va.
METAL-CERAMIC STRUCTURAL MATERIALS
10 Nov. 1972 52 p refs Transl. into ENGLISH from the Russian-language collection "Metallokeramicheskiye Konstruktsionnyye Materialy" Kiev, Acad. of Sci. of the Ukr. SSR. Inst. of Probl. of the Sci. of Mater., 1972
(JPRS-57487) Avail: NTIS HC $4.75

Production engineering methods for the formation of structural

parts from cermet metal powder matrices are reported. For individual titles, see N73-13516 through N73-13524.

N73-13516 Joint Publications Research Service, Arlington, Va.
CHROMIUM METAL-CERAMIC MATERIALS OF INCREASED STRENGTH
V. A. Dymchenko and I. D. Radomyselskiy *In its* Metal-Ceram. Struct. Mater. 10 Nov. 1972 p 1-2 (For availability see N73-13515 04-17)

Strength properties of metal-ceramic structural materials based on iron and obtained by compaction and sintering, are considered. Increased stability of austenite is achieved by introducing orthorhombic chromium carbide into the iron powder. This method requires no protective atmosphere for additional drying to achieve homogenization of the alloy; the chromium materials cause cold hardening of the austenite because of their high degree of wear resistance in the presence of martensite and residual austenite. G.G.

N73-13517 Joint Publications Research Service, Arlington, Va.
METAL-CERAMIC STRUCTURAL MATERIALS WITH ADDITIONS OF SOLID LUBRICANTS
I. M. Federchenko, V. D. Zozulya, and I. I. Ivanova *In its* Metal-Ceram. Struct. Mater. 10 Nov. 1972 p 3-7 refs (For availability see N73-13515 04-17)

The characteristics of dry sliding friction were studied for ceramic materials based on iron, containing the fluorides of Al, Ba, Ca, and Mg, barium chloride, and barium carbonate. It was established that as solid lubricants the fluorides of Ca and Ba, $BaCl_2$ and $BaCO_3$ may be used. The friction factor achievable at an optimum content of the admixtures amounts to 0.35--0.55, and the given wear is 5--14 mg/sq cm per hour. Author

N73-13518 Joint Publications Research Service, Arlington, Va.
SOME FEATURES OF FERROTUNGSTEN METAL-CERAMIC MATERIALS
I. D. Radomyselskiy, G. P. Negoda, V. B. Deymontovich, and M. L. Gorb *In its* Metal-Ceram. Struct. Mater. 10 Nov. 1972 p 8-14 refs (For availability see N73-13515 04-17)

The dependence of the volumetric shrinkage of briquets of ferrotungsten alloys upon the sintering temperature and tungsten content in the initial alloy was established. Such a dependence is associated with the nature of the reaction between the elements in the alloy and with all those transformations which are observed in the diagram of state of the ferrotungsten. The variation of the properties during sintering is manifested more intensively in briquets of a mixture of powders than in briquets of alloy powders. Alloys of powders obtained by means of joint reduction of oxides, for which the appearance of a second phase is associated with the separation of the excess quantity of tungsten from the matrix solution, have the greatest strength. Alloys containing 10% tungsten, i.e., alloys with a single-phase structure of the supersaturated alpha-solid solution, have maximum strength characteristics. Author

N73-13519 Joint Publications Research Service, Arlington, Va.
INVESTIGATION AND DEVELOPMENT OF NEW METHODS OF FABRICATING PARTS OF MOLDS AND STAMPS FROM METAL POWDERS c15
V. P. Severdenko, M. Ya. Kutser, Ye. V. Zvonarev, and V. N. Bulakh *In its* Metal-Ceram. Struct. Mater. 10 Nov. 1972 p 15-22 (For availability see N73-13515 04-17)

The technological process for the fabrication of metal powder cermets by cold plastic deformation of sintered powder blanks includes extrusion of the working profile, machining, and chemical heat treatment. A sintered metal ceramic composition consisting of 80% Fe, 20% PKhZO and high alloy steel powder PKhZO provides high plastic properties and resistance to high loads and intensive wear. Permeation of these specimens with copper and brass increased their resistance to compression with less linear shrinkage. A permeating composition of Cu + 7% Fe increased all mechanical properties of the blanks. G.G.

N73-13520 Joint Publications Research Service, Arlington, Va.
PROPERTIES OF STRUCTURAL MATERIALS BASED ON TITANIUM POWDERS
I. M. Federchenko, R. K. Ognev, V. B. Raytses, N. A. Kazantseva, G. G. Kolomoyets, V. M. Anokhin, V. P. Rutberg, and D. L. Dubrov *In its* Metal-Ceram. Struct. Mater. 10 Nov. 1972 p 23-25 (For availability see N73-13515 04-17)

An investigation was made of ceramet materials based on titanium, alloyed with molybdenum and aluminum. As a result ceramet materials containing aluminum and molybdenum in a quantity from 2 to 4% were found and are recommended for the fabrication of structural parts in motor building, transport machine building, and other fields. The following technology was developed from experimental materials for the fabrication of the parts. The initial metal, electrolytic titanium powder of a fraction from 0.18 to 0.04 millimeters, is mixed in mechanical mixers with the appropriate quantity of aluminum and molybdenum powders for 8--10 hours. The mixture obtained is compacted in steel molds at a specific pressure of 8 tons per square centimeter. The relative density after compaction amounts to 85--95%. The compacted parts are subjected to sintering at temperatures of 400 C for increased density. Additions of aluminum and molybdenum increase the strength of the titanium. Author

N73-13521 Joint Publications Research Service, Arlington, Va.
TECHNOLOGICAL PROPERTIES OF ELECTROLYTIC TITANIUM POWDERS OBTAINED AT REDUCED TEMPERATURES
S. V. Titarenko, I. D. Radomyselskiy, V. A. Drozenko, and L. N. Antipin *In its* Metal-Ceram. Struct. Mater. 10 Nov. 1972 p 26-33 refs (For availability see N73-13515 04-17)

The compactibility of electrolytic powders is determined by their granulometric and chemical composition and depends only slightly upon the electrolysis temperature regime. The shrinkage of specimens of low temperature titanium is higher than the shrinkage of specimens of titanium obtained with an ordinary electrolysis temperature regime. Low temperature titanium is more sensitive to an increase in microhardness because of the absorption of residual gases during sintering in a vacuum below 0.00001 millimeters Hg. Author

N73-13522 Joint Publications Research Service, Arlington, Va.
LARGE-SIZED MATRICES OF CHROMIUM-CARBIDE ALLOYS FOR COLD DRAWING OF PIPES
V. N. Klimenko, V. A. Maslyuk, I. D. Radomyselskiy, and I. A. Fomin *In its* Metal-Ceram. Struct. Mater. 10 Nov. 1972 p 34-38 (For availability see N73-13515 04-17)

Investigation of hot pressing regimes of chromium nickel carbide alloys made it possible to establish the optimum technological parameters of the process: a temperature of 1220 - 1250 C, and a pressure of 100 - 200 kilograms per square centimeter. On the basis of this investigation, a technology has been developed for obtaining large sized bushings for matrices of KKhN-15 alloy, intended for cold drawing of steel and brass pipes. Industrial tests demonstrated that chromium carbide matrices, with respect to strength (endurance) are equal in value to a tool of VK-8 hard alloy and are superior to a tool of carbon tool steels by a factor of 40 - 70. The use of chromium carbide drawing matrices as a replacement for steel and tungsten-carbide matrices is economically feasible. Author

N73-13523 Joint Publications Research Service, Arlington, Va.
DISPERSION HARDENING OF A CHROMIUM-NICKEL ALLOY OF COMPLEX COMPOSITION
G. V. Surayeva, F. N. Krylova, and A. F. Silayev *In its* Metal-Ceram. Struct. Mater. 10 Nov. 1972 p 39-43 (For availability see N73-13515 04-17)

The hardening of a chromium nickel alloy of complex composition by zirconium dioxide leads to an increase in the short term strength of the alloy at high temperatures. Such hardening phases as magnesium oxide and aluminum oxide cannot be used, as they lead to an increase in the residual porosity as a result of the reaction with the components of the alloy. Regimes of heat treatment applied for cast alloys of a similar composition do not provide the optimum structure of the composition alloy. Author

N73-13524 Joint Publications Research Service, Arlington, Va.
HIGH-CAPACITY EQUIPMENT FOR PRESSING AND GAUGING OF STRUCTURAL PARTS c14
Ya. S. Goldman, V. V. Polivanov, S. V. Bronin, T. O. Baskakov, and G. A. Grankin *In its* Metal-Ceram. Struct. Mater. 10 Nov. 1972 p 44-47 (For availability see N73-13515 04-17)

Technical characteristics and fabrication of rotary automatic equipment for pressing and gauging of structural parts from metal ceramic matrices are reported. The design of a multiple nomenclature rotary automatic device, capable of pressing parts that are different in configuration and height, is outlined. G.G.

N73-13525# Joint Publications Research Service, Arlington, Va.
ABSTRACTS OF REPORTS PRESENTED AT THE FIRST ALL UNION CONFERENCE ON METAL DIELECTRIC PHASE TRANSITIONS
N. B. Brandt, Kh. Dittman, Do Chan Kat, and G. O. Andrianov 30 Nov. 1972 13 p refs Transl into ENGLISH of "Sbornik Kratkikh Soderzhaniy Dokladov, Predstavlennykh na i Vsesoyuznuyo Konferentsiyu po Fazovym Perekhodam Metall-Dielektrik" Moscow, 1972
(JPRS-57631) Avail: NTIS HC $3.00

Metal-dielectric phase transitions of Bi-Sb alloys in strong magnetic fields and of Bi(1-x)Sb(x) alloys under pressure are discussed. The behavior of a two-zone model of metal relative to annihilation scattering is described, as well as the light absorption in V2O3. Author

N73-13526# Joint Publications Research Service, Arlington, Va.
GRAPHITES AND TITANIUM ALLOYS
5 Dec. 1972 7 p Transl. into ENGLISH from Tsventn. Metal. (Moscow), no. 8, 1972 2 p
(JPRS-57679) Avail: NTIS HC $3.00

Soviet industry uses of silicon carbides and titanium alloys are discussed, emphasizing their corrosion resistance and mechanical properties. For individual titles, see N73-13527 through N73-13528.

N73-13527 Joint Publications Research Service, Arlington, Va.
SILICIFIED GRAPHITE
In its Graphites and Titanium Alloys 5 Dec. 1972 p 1-2
(For availability see N73-13526 04-17)

Various uses of silicon graphite are discussed, as well as using a diamond tool to machine silicon graphite products. Shapes and dimensions of this compound are cited, along with its erosion and corrosion resistance. Varied grades of silicon graphite properties and its resistance effects to aggressive media are included in tabular form. J.A.M.

N73-13528 Joint Publications Research Service, Arlington, Va.
HEAT-RESISTANT TITANIUM ALLOYS
In its Graphites and Titanium Alloys 5 Dec. 1972 p 3-4
(For availability see N73-13526 04-17)

The uses of heat resistant titanium alloys in Soviet industry are reported, including forgings, stampings, rolled and pressed rods, and profiles. The mechanical properties of the titanium alloys are reviewed, at high temperature, emphasizing the workability of specific alloys and their corrosion resistance. J.A.M.

N73-13529*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF HIGH TEMPERATURE BRAZING AND THERMAL CYCLING ON MECHANICAL PROPERTIES OF HASTELLOY X.
Dennis L. Dicus and John D. Buckley Washington Jan. 1973 22 p refs
(NASA-TM-X-2704; L-8561) Avail: NTIS HC $3.00 CSCL 11F

Data are presented on the effects of brazing alloy, brazing operation, thermal cycling, and combinations of these on the yield strength, elongation, ultimate tensile strength, and fatigue life of thin gage Hastelloy X. These data show that brazing with a Ni-Pd-Au alloy at 1461 K resulted in reductions of 35 percent in yield strength and elongation, 6 percent in ultimate tensile strength, and 18 percent in fatigue limit of Hastelloy X, as compared with as-received material. Subsequent exposure to 200 thermal cycles between 533 K and 1144 K after brazing caused further losses of 4 percent in yield strength, 8 percent in ultimate tensile strength, and 6 percent in fatigue limit. Author

N73-13530*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIFFUSIONAL CREEP AND CREEP DEGRADATION IN THE DISPERSION-STRENGTHENED ALLOY TD-NiCr
John D. Whittenberger Washington Dec. 1972 30 p refs
(NASA-TN-D-7079; E-7080) Avail: NTIS HC $3.00 CSCL 11F

Dispersoid-free regions were observed in TD-NiCr (Ni-20Cr-2ThO2) after slow strain rate testing in air from 1145 to 1590 K. Formation of the dispersoid-free regions appears to be the result of diffusional creep. The net effect of this creep is the degradation of TD-NiCr to a duplex microstructure. Degradation is further enhanced by the formation of voids and intergranular oxidation in the thoria-free regions. These regions apparently provided sites for void formation and oxide growth since the strength and oxidation resistance of Ni-20Cr is much less than Ni-20Cr-2ThO2. This localized oxidation does not appear to reduce the static load bearing capacity of TD-NiCr since long stress rupture lives were observed even with heavily oxidized microstructures. But this oxidation does significantly reduce the ductility and impact resistance of the material. Dispersoid-free bands and voids were also observed for two other dispersion strengthened alloys, TD-NiCrAl and IN-853. Thus, it appears that diffusional creep is charactertistic of dispersion-strengthened alloys and can play a major role in the creep degradation of these materials. Author

N73-13531# Atomic Energy Establishment, Cairo (Egypt). Nuclear Chemistry Dept.
SPECTROPHOTOMETRIC QUANTITATIVE YIELD DETERMINATION OF ANTIMONY
S. Allam, N. Zakaria, and A. A. Abdel-Rassoul 1971 36 p refs
(AREAEE-126) Avail: AEC Depository Libraries

Preliminary investigations of several spectrophotometric techniques proved the iodoantimonous acid to be very applicable for quantitative yield estimation of trace concentrations of antimony. The developed procedure is based upon the formation of a yellow color when KI-ascorbic acid reagent is added to antimony solution in 10% sulphuric acid medium. The colored complex has two absorption maxima at 330 millimicron and 425 millimicron. Experimental data provided molar extinction coefficient values at 4.66 x 100,000 at 330 millimicron and 8.4 x 6 to the fourth power at 425 millimicron. The method is highly sensitive and has no extraction steps compared with other spectrophotometric procedures. Author

N73-13532# Institute of Nuclear Techniques, Krakow (Poland).
PSEUDOPOTENTIAL METHOD IN THE THEORY OF METALS
Krystyna Luczynska Dec. 1971 27 p In POLISH; ENGLISH summary
(ITJ-16) Avail: AEC Depository Libraries

The pseudopotential method describes effective interaction between electrons of conductivity and a metal crystal field; it leads to the diffraction model which allows to calculate properties of ideal metals as well as those of real metals. Author

N73-13533# Aktiebolaget Atomenergi, Studsvik (Sweden).
METALLOGRAPHIC STUDY OF NEUTRON IRRADIATED AND UNIRRADIATED 12R72HV AFTER TENSILE TESTING
P. Lindhagen, R. Westin, and E. Hellstrand May 1971 15 p refs In SWEDISH
(STU-70-419/U-350-A; AE-MF-204) Avail: AEC Depository Libraries

A metallographic study of neutron irradiated, as well as unirradiated, 12R72HV steel after tensile testing is described. Before testing, the steel was annealed at 1150 C as well as coldworked to 15% and annealed at 830 C. It was found that neutron irradiation lowered the ductility by tensile testing in the temperature range 500 to 800 C. Helium bubbles formed by plastic deformation prevented dislocation movements. It was established that there was only a slight grain deformation before crack. Comparison has been made with earlier observations after heat treatment at 1100 C. The lowering of ductility according to irradiation was less in these earlier observations. This can be explained with smaller grain size, more favorable titanium carbide structure, and bigger helium bubbles. NSA

N73-13534# Iowa State Univ. of Science and Technology, Ames.
REACTION OF Fe-Ni-Cr ALLOYS WITH OXYGEN CONTAINING SODIUM Ph.D. Thesis
Paul Chu-Sheng Wu May 1972 89 p refs
(Contract W-7405-eng-82)
(IS-T-508) Avail: NTIS

Metallographic, electron microprobe, and X-ray diffraction analyses were employed to identify the reaction products formed in the reaction band between oxygen-containing sodium and Inconel 600. Hexagonal sodium chromite, NaCrO2, is the principal product formed at temperatures of 650, 750, and 850 C. The reaction bands showed evidence of grain boundary penetration and internal oxidation. Similar analyses showed that minor surface reaction and grain boundary penetration occurred at the interface of pure iron and pure nickel in contact with oxygen-saturated sodium at 850 C. The nickel interface showed the least evidence of attack. There was no evidence of adherent reaction products at the surface or in the grain boundaries. Author (NSA)

N73-13535# Ames Lab., Iowa.
TIGHT-BINDING INTERPOLATION SCHEMES APPLIED TO MOLYBDENUM AND COPPER M.S. Thesis
Randall Jay Iverson May 1972 36 p refs
(Contract W-7405-eng-82)
(IS-T-515) Avail: NTIS

Tight binding interpolation schemes which represent transition and noble metal s, p, and d bands were applied to molybdenum and copper. A tight-binding scheme for bcc metals was used to fit first principle calculations of the energy bands of Mo and obtain Fermi surfaces, which were compared to de Haas-van Alphen and radio frequency size effect experimental data. A spin-orbit parameter of 0.0075 Ry (equal to the atomic spin-orbit parameter) was found to give the proper cross sectional areas for the electron lens on the Delta axis and the neck of the electron jack. A tight binding interpolation scheme for fcc metals was developed, applied to Cu, and compared to the widely used LCAO-OPW interpolation scheme. It appears that the only significant differences appear above the top of the pure d bands, where the tight binding scheme has too low a density of states and the LCAO-OPW scheme too high a density of states compared to the first-principles calculations. Author (NSA)

N73-13536# Pittsburgh Univ., Pa. Dept. of Chemistry.
THERMAL, STRUCTURAL, AND MAGNETIC STUDIES OF METALS AND INTERMETALLIC COMPOUNDS Annual Report, 15 May 1971 - 15 May 1972
W. E. Wallace and R. S. Craig 1 Jun. 1972 40 p refs
(Contract AT(11-1)-3429)
(COO-3427-7) Avail: NTIS

Structural-, thermal-, and magnetic-property studies are reported for the following metals and intermetallic compounds: Alloys of calcium, aluminum, cerium, cobalt, dysprosium, erbium, gadolinium, holmium, indium, iron, lanthanum, neodymium, nickel, praseodymium, ytterbium, yttrium; and for cerium, thorium, and ytterbium. G.G.

N73-13537# California Univ., Berkeley. Lawrence Berkeley Lab.
ENHANCEMENT OF FRACTURE TOUGHNESS IN HIGH STRENGTH STEEL BY MICROSTRUCTURAL CONTROL
E. R. Parker and V. F. Zackay Apr. 1972 50 p refs Presented at Symp. on Fracture and Fatigue, Washington, D. C., 3 May 1972
(Contract W-7405-eng-48)
(LBL-832; Conf-720540-1) Avail: NTIS

The creation of new and unusual microstructures, utilizing a variety of thermal and thermomechanical processes is presented. The quantitative relationships of mechanical properties (strength, ductility, work hardening, and fracture toughness) with composition and microstructure are discussed for the newly developed TRIP steels. It is shown how the fracture toughness of low alloy quenched and tempered steels with yield strengths over 200,000 psi can be improved by as much as 70 percent by microstructural control. The initial results of research on alloys intended for cryogenic service are described. The composition, heat treatment, microstructure and properties of an alloy having more than three times the toughness of the presently used alloys are discussed. Author

N73-13538# Cornell Univ., Ithaca, N.Y. Materials Science Center.
QUANTITATIVE STUDY OF VACANCY DEFECTS IN QUENCHED PLATINUM BY FIELD ION MICROSCOPY AND ELECTRICAL RESISTIVITY. 2: ANALYSIS AND INTERPRETATION
David N. Seidman, A. S. Berger, and R. W. Balluffi Apr. 1972 30 p refs Sponsored by AEC
(COO-3158-5; Rept-1786) Avail: NTIS

A detailed series of quantitative calculations on divacancy to monovacancy concentration ratios in quenched platinum specimens showed that this ratio was not affected by specimen storage and electropolishing procedures subsequent to the quench and hence represented the concentration ratio at freeze-out temperature. It is then shown that all combinations of divacancy binding energy and binding entropy which lead to a quenched-in value of the concentration ratio equal to 0.06 plus or minus 0.02 for a quench temperature of 1700 C were governed by a linear relationship. Author

N73-13539# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
INTRODUCTION TO CORROSION CONTROL DESIGN
Lyle D. Perrigo 1972 37 p refs Presented at Western States Corrosion Seminar, Pomona, Calif., 2 May 1972 Revised
(Contract AT(45-1)-1830)
(BNWL-SA-3817-Rev-1; Conf-720538-1) Avail: NTIS

Corrosion control design optimized the use of layouts, orientation, location, and configuration to reduce corrosion attack. A design philosophy wherein the application of common anticorrosion measures and techniques reducing corrosion losses is presented. Author

N73-13540# European Atomic Energy Community, Petten (Netherlands). Joint Nuclear Research Center.
PROPERTIES OF REFRACTORY METALS
G. L. Ferrero May 1972 41 p refs In FRENCH
(EUR-4757) Avail: AEC Depository Libraries; EUR FB 60,-

Physical, chemical, thermal, and mechanical properties together with temperature-dependent details where applicable, of refractory metals which can be used for the construction of high-temperature irradiation rigs are reported. The data are arranged to provide easy comparisons in the selection of the metals. Author (NSA)

N73-13541# Cornell Univ., Ithaca, N.Y. Materials Science Center.
QUANTITATIVE STUDY OF VACANCY DEFECTS IN QUENCHED PLATINUM BY FIELD ION MICROSCOPY AND ELECTRICAL RESISTIVITY. 1: EXPERIMENTAL RESULTS
A. S. Berger, David N. Seidman, and R. W. Balluffi Mar. 1972 32 p refs Sponsored in part by AEC and ARPA
(NYO-3504-55; rept-1747) Avail: NTIS

It is demonstrated by means of field ion microscopy that the measured ratio of divacancy concentration to monovacancy concentration (c sub 2v/c sub 1v) in high purity platinum specimens quenched from 1700 + or - 1C was 0.06 + or - 0.02. Author

N73-13542# Pittsburgh Univ., Pa. Dept. of Physics.
STUDY OF RADIATION INDUCED DEFECTS IN METALS Final Report, 15 Jan. 1966 - 14 Jan. 1972
John R. Townsend 5 Jun. 1972 6 p refs
(Contract AT(11-1)-3431)
(COO-3431-1) Avail: NTIS

The topics discussed fall under three major categories: (1) effects of low temperature proton irradiation on the Young's modulus and internal friction of copper and tungsten, (2) computer simulation of point lattice defects and the resulting changes in the elastic bulk modulus, and (3) piezoresistance in metals arising from stress-induced ordering of point defects. Author (NSA)

N73-13543# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
COMPOSITE MATERIALS: ALUMINUM-SILICON CARBIDE Final Report [MATERIAUX COMPOSITES: ALUMINIUM - CARBURE DESILICIUM RAPPORT FINAL]
M. Marchal and M. Cantagrel [1971] 53 p In FRENCH
(Contract DRME-69/395)
Avail: NTIS HC $4.75

Two silicon carbide reinforced composites with a nickel and an aluminum matrix have been manufactured. A technique for the manufacture of an aluminum/silicon carbide test tube by casting or infiltration of matrix through a fiber network was investigated as well as an electrolytic procedure for manufacturing the nickel/silicon carbide composite. Both techniques have enabled prediction of the reinforcement degree obtained by combining the metals with silicon carbide fibers. It is shown that the SiC/Ni composite is not suitable for high temperature applications. For the SiC/A composite it is necessary to separate the SiC fibers during the liquid aluminum impregnation and to maintain the liquid Al at a temperature of less than 800 C. Author (ESRO)

N73-13544# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
ALLOYS WITH HIGH MECHANICAL CHARACTERISTICS Final Report [ALLIAGES A HAUTES CARACTERISTIQUES MECANIQUES RAPPORT FINAL]
M. Marchal [1971] 30 p In FRENCH
(Contract DGRST-69-02-102)
Avail: NTIS HC $3.50

Composite test tubes were manufactured with pure nickel or alumina trichites using the electrolysis technique. Carbon was substituted for titanium, previously used, to improve the adherence of the matrix on the reinforcing fibers. Six cylindrical test tubes with thread heads containing 10% trichites have been produced. Author (ESRO)

N73-13545# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
METALLURGICAL AND ELECTROCHEMICAL ASPECTS OF STRESS CORROSION CRACKING OF TITANIUM ALLOYS [FACTEURS METALLURGIQUES ET ELECTROCHIMIQUES DE LA CORROSION SOUS CONTRAINTE DES ALLIAGES DE TITANE]
Alain Vassel 1972 47 p refs In FRENCH; ENGLISH summary
Sponsored by Deleg. Gen. a la Rech. Sci. et Tech.
(ONERA-P-145) Avail: NTIS HC $4.50

Linear elastic fracture mechanics is applied to the study of stress corrosion cracking in saline water of two industrial titanium alloys: TA6V and TU2. TU2 alloy was found quite insensitive to cracking in the corrodent, quenched and aged states. It is shown that it is possible to make TA6V alloy nearly insensitive to stress corrosion cracking by heating in the beta range before a usual quenching and aging treatment. The electron microautoradiography technique of tritium permitted to establish that the mechanism of crack propagation in saline water is a form of hydrogen embrittlement. Author (ESRO)

N73-13546# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Mechanics.
EFFECTS OF LOCAL STRENGTH VARIATIONS ON PLASTIC ENCLAVE DEVELOPMENT AT CRACK TIPS
Michael R. Kahl and Kenneth L. Reifsnider 21 Jun. 1972 73 p refs
(Contract DAAF07-69-C-0444)
(AD-747783; VPI-E-72-15) Avail: NTIS CSCL 11/6

Existing literature dealing with plastic zones near crack tips idealizes materials in the various analyses to have constant and uniform yield strength throughout the region under investigation, at least initially. Such an assumption is not easily defended if one is to consider cracks in real engineering components which may have been forged, cold worked, annealed, or cast during manufacture. This paper establishes analytically and experimentally the influence of one-dimensional yield strength gradients on the size and shape of plastic zones in single edge notched (SEN) 7075-T6 aluminum specimens. Author (GRA)

N73-13547# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PHYSICO-CHEMICAL PROPERTIES OF WHEEL STEEL AND ITS DEOXIDATION PRODUCTS
S. I. Poel, A. A. Deryabin, N. I. Isaev, and G. N. Vasilenko 22 May 1972 11 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), v. 12, no. 8, 1969 p 5-8
(AD-747828; FTD-HC-23-93-72) Avail: NTIS CSCL 11/6

The surface properties of wheel steel in contact with oxide melts whose composition was close to that of deoxidation products were examined to determine the degree of potential contamination of the steel with nonmetallic impurities. Author (GRA)

N73-13548# Naval Research Lab., Washington, D.C.
THE EFFECT OF THICKNESS UPON SUSTAINED LOAD CRACK PROPAGATION IN Ti-6Al-4V ALLOY TESTED IN 3-1/2 PERCENT NaCl SOLUTION
C. D. Beachem and D. A. Meyn 8 Aug. 1972 14 p refs
(NRL Proj. M01-08; RR02201465406)
(AD-748591; NRL-7449) Avail: NTIS CSCL 11/6

The titanium alloy Ti-6Al-4V was found to be susceptible to sustained load cracking in 3-1/2% NaCl solution, and this susceptibility increased with specimen thickness. The sensitivity to thickness was found in the thickness range near that required for plane strain crack propagation. Cracking rates were also found to increase with increasing specimen thickness. The mechanism for the sustained load cracking may have been either a stress corrosion cracking mechanism arising from the presence of the salt water or a hydrogen-assisted cracking mechanism arising from the hydrogen content of the alloy. Author (GRA)

N73-13549# Army Materials and Mechanics Research Center, Watertown, Mass.
EFFECT OF TEXTURE ON THE CHARPY IMPACT ENERGY OF SOME TITANIUM ALLOY PLATE
Anthone Zarkades and Frank R. Larson Jun. 1972 27 p refs
(DA Proj. 1T0-61102-B-32-A)
(AD-748390; AMMRC-TR-72-21) Avail: NTIS CSCL 14/2

An investigation to determine the anisotropic nature of toughness due to texture in titanium and titanium alloy plate was conducted. Standard Charpy V-notch specimens were machined at ten-degree increments from the rolling to the transverse direction with notch orientation either parallel or perpendicular to the plate surface. Basal pole figures were determined along with impact energy, tensile properties, and microstructure. The study revealed that significant toughness variations can be found in titanium plate as a function of specimen and notch orientation. This impact energy anisotropy can be related to texturing with normal fibering effect being small or absent. An explanation of the toughness variation on a simplified crystallographic slip basis is given. Titanium plate studied includes commercially pure, Ti-6Al-4V, Ti-4Al-4V, Ti-4Al-4Mn, and Ti-8Mn. Author (GRA)

N73-13550# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CRITICAL COLD-WORK FOR GRAIN COARSENING OF EQUIAXED ALPHA Ti-5Al-2.5Sn M.S. Thesis
Thomas Kittrell Moore Jun. 1972 60 p refs
(AD-748352; GAW/MC/72-12) Avail: NTIS CSCL 11/6

An investigation was conducted on grain coarsening of a Ti-5Al-2.5Sn titanium alloy heated at 1144K (1600F) for one hour after plastic tensile deformation. Cylindrical tensile test specimens were pulled up to 13% elongation to determine the linear plastic deformation and work energy input necessary to cause maximum grain coarsening after heat treatment. The influence of strain, deformation temperature, strain rate, and grain size on grain coarsening was studied. Author (GRA)

N73-13551# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INVESTIGATION OF THE HOT CORROSION MECHANISM IN NICKEL-8 CHROMIUM-6 ALUMINUM M.S. Thesis
Nathan J. Adams, Jr. Jun. 1972 61 p refs
(AD-748349; GAW/MC/72-1) Avail: NTIS CSCL 11/6

The mechanism of hot corrosion in a nickel-chromium-aluminum alloy was investigated. The effects of three sodium salts (sulfate, carbonate, and nitrate) were studied at 100C in 150 torr oxygen; additionally, tests were conducted with sodium sulfate at 900C in oxygen and at 1000C in argon. Continuous gravimetric data were taken for each experiment; corroded specimens were analyzed using X-ray diffraction, metallographic, and electron microprobe techniques. The hot corrosion mechanism involves a sequence of events; formation of an oxide layer, formation of subsurface chromium sulfides, dissolution of the protective oxide scale, and oxidation of the sulfides and the chromium-depleted substrate. The role of sulfur in the hot

corrosion process is the depletion of chromium in the alloy; the alloy is thus susceptible to increased oxidation. Author (GRA)

N73-13552# Battelle Columbus Labs., Ohio. Metals and Ceramics Information Center.
SUPERALLOYS: PROCESSINGS
Sep. 1972 623 p refs Proc. of the Intern. Conf., Champion, Pa., 18-20 Sep. 1972
(Contract DSA900-73-C-0922; F33615-71-C-1067)
(AD-748159; MCIC-72-10) Avail: NTIS CSCL 11/6

The book contains the full text of each of the 28 papers presented at the Second International Conference on Superalloys -- Processing. Sponsored by the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), the conference was held September 18 and 19, 1972, in Champion, Pennsylvania. Author (GRA)

N73-13553# Army Construction Engineering Research Lab., Champaign, Ill.
DIRECTIONAL TRANSFORMATIONS IN STEEL-ALLOY DEVELOPMENT Preliminary Report
R. Quattrone, M. S. Muntner, and C. M. Wayman Jul. 1972 17 p refs
(DA Proj. 4A0-61101-A-91D)
(AD-748408; CERL-PR-M-21) Avail: NTIS CSCL 11/6

The study is part of an overall project to develop techniques for producing directional martensite in steel and to assess the properties of such a material. The objective of the work reported herein was to select suitable ferrous alloys. Analyses of the texturing and transformation behavior of austenite were conducted to determine the composition ranges which might be suitable for transformation to directional martensite. On the basis of these analyses, it was concluded that satisfactory alloys would be characterized by a stable austenite with a low M sub s and M sub d and a lath transformation product. Author (GRA)

N73-13554# Dayton Univ. Research Inst., Ohio.
FRACTURE TOUGHNESS AND FATIGUE CRACK GROWTH PROPERTIES OF 7175-T736 ALUMINUM ALLOY FORGING AT SEVERAL TEMPERATURES Final Report, Jun. 1970 - May 1971
Raymond E. Jones Wright-Patterson AFB, Ohio AFML Feb. 1972 37 p refs
(Contract F33615-71-C-1054; AF Proj. 7381)
(AD-748257; UDRI-TR-71-46; AFML-TR-72-123) Avail: NTIS CSCL 11/6

Tensile, fracture toughness, and crack growth properties of a 7175-T736 aluminum alloy forging were investigated at various temperatures from -65F to 350F. Room temperature tensile and fracture toughness data was compared to similar properties for wrought 7075 products. The 7175 appears to be a better alloy. Fatigue crack growth rates at room temperature were similar to 7075-T6 and 7075-T7352 crack growth data in the literature. Crack growth rates increased with increasing temperature from room temperature to 350F. Crack growth rates below room temperature were probably affected by humidity variations causing condensation of moisture at the crack tip and results were inconsistent. Author (GRA)

N73-13555# Dayton Univ. Research Inst., Ohio.
RESEARCH ON RARE EARTH-COBALT ALLOYS AND COMPOUNDS Technical Report, 15 Oct. 1970 - 1 Nov. 1971
Jacques Schweizer Wright-Patterson AFB, Ohio AFML Apr. 1972 79 p refs
(Contract F33615-70-C-1625; AF Proj. 7371)
(AD-748270; UDRI-TR-72-27; AFML-TR-72-82) Avail: NTIS CSCL 11/6

The report contains a collection of six papers dealing with some magnetic properties of rare earth-cobalt alloys and the crystalline and magnetic structures of some rare earth-cobalt intermetallic phases. GRA

N73-13556# Sherritt Gordon Mines, Ltd., Fort Saskatchewan (Alberta).
IMPROVEMENT OF THE OXIDATION RESISTANCE OF DISPERSION STRENGTHENED NICKELCHROMIUM ALLOYS Final Technical Report, 1 Apr. 1970 - 30 Sep. 1971
Donald H. Timbres, L. Fredrick Norris, and Maurice A. Clegg Wright-Patterson AFB, Ohio AFML Jul. 1972 77 p refs
(Contract F33615-70-C-1199; AF Proj. 7351)
(AD-748266; AFML-TR-72-50) Avail: NTIS CSCL 11/6

The cyclic dynamic oxidation and hot corrosion behavior at 2000F (1093C) and 2200F (1204C) of Ni/Cr/ThO2 alloys modified by additions of 5 w/o aluminum and 0.2 w/o yttrium or 3 - 5 w/o manganese were measured. Alloys of the composition Ni/16-20Cr/5Al/2ThO2 exhibited the best oxidation resistance having a smaller weight change and less damage by spalling or erosion than the manganese-modified alloys. A thermomechanical procedure was defined to produce a coarse grain microstructure in the aluminum-modified alloys. The procedure consists of primary working by extrusion followed by secondary working by swaging or rolling. The resulting coarse grained alloys have good stress-rupture strength at 2000F (1093C) but the ultimate tensile strength is low. A coarse thoria size resulting during processing of the powder through the consolidation step was believed to have contributed to the low tensile strengths at 2000F (1093C). Author (GRA)

N73-13557# National Materials Advisory Board, Washington, D.C.
HIGH PERFORMANCE CASTINGS Final Report
Mar. 1972 247 p refs
(Contract DA-49-083-OSA-3131)
(AD-748462; NMAB-291) Avail: NTIS CSCL 11/6

The report delineates the factors influencing the characteristics, design, and properties of high-performance castings and the outstanding problems that must be resolved to enhance the reliability and use of these castings. It suggests a number of programs and methods to improve their integrity and acceptance. A satisfactory end-product requires close cooperation between the product designer and the foundryman. To use high-performance castings at their full potential, reliable design data must be available to the designer, and designers must become as knowledgeable about casting design procedures as they are about the design of forgings and other products. An integrated plan is proposed to make these castings competitive with forgings and specific recommendations are proposed for individual metallic alloys systems. Author (GRA)

N73-13558# Little (Arthur D.), Inc., Cambridge, Mass.
EFFECT OF APPLIED ELECTRIC FIELDS ON THE MECHANISMS OF OXIDATION OF METALS AND ALLOYS Final Report, 17 Mar. - 17 Dec. 1971
John B. Berkowitz, John Ketteringham, Edward T. Peters, and John Sienczyk Apr. 1972 46 p refs
(Contract N00019-71-C-0149)
(AD-748297; ADL-730) Avail: NTIS CSCL 11/6

The effects of applied electrical potentials on the mechanisms of hot corrosion have been studied in a potassium sulfate seeded propane/air flame at temperatures of about 1200C. Experiments were carried out with Chromel A (Ni - 20 Cr), Nickel, molybdenum, and tungsten at potentials of 250V dc. Currents were of the order of milliamps. Both the nature of the corrosion reactions and the rates were found to be functions of electrode polarity. Electron microbe analysis of the Chromel A samples indicated enhanced sulfidation at the anode and enhanced oxidation at the cathode. Alkali metal ions seemed to be strongly attracted to the cathode and repelled from the anode. Experiments up to 1000 volts with Chromel A showed decreased net corrosion at both electrodes. Author (GRA)

N73-13559# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DILATOMETRIC STUDY OF PHASE TRANSFORMATIONS IN HIGH-CHROMIUM STEELS
N. G. Shulga and M. F. Zamora 25 May 1972 12 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chernaya Met. (Moscow), no. 9, 1963 p 156-160
(AD-749522; FTD-MT-24-1422-71) Avail: NTIS CSCL 11/6

Specimens of martensitic, semiferritic, and ferritic steels were subjected to microstructural analysis. Changes in the coefficient of thermal expansion is determined as a function of temperature for heating, slow cooling, and tempering. Author (GRA)

N73-13852* Lincoln Lab., Mass. Inst. of Tech., Lexington.
SATELLITE COMMUNICATION AND NAVIGATION FOR MOBILE USERS
Steven L. Bernstein *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 247-257 (For availability see N73-13829 04-30)
CSCL 17B

N73-13853* Page Communications Engineers, Inc., Washington, D.C.
A NEW DEVICE FOR COMMUNICATION SYSTEMS
R. R. Beck *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 259-264 (For availability see N73-13829 04-30)
CSCL 17B

N73-13854* Communications Satellite Corp., Washington, D.C.
COMMUNICATIONS VIA SATELLITE - DIVIDEND OF THE SPACE AGE
Gustave J. Rauschenbach *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 265-277 (For availability see N73-13829 04-30)
CSCL 17B

N73-13855* Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.
DEVELOPMENT AND APPLICATION OF COLOR TELEVISION FOR APOLLO 15 AND BEYOND
Samuel Russell *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 279-284 (For availability see N73-13829 04-30)
CSCL 17B

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N73-13560 CEGB Information Services, London (England).
TRANSITION METAL CARBIDES A Selective Bibliography, 1956 - Feb. 1972
P. G. Williams, comp. Sep. 1972 19 p refs
(CE-Bib-228) Avail: Issuing Activity

A selective bibliography of reports on transition metal carbides for the period 1956 to 1972 is presented. The subjects include: (1) general articles, (2) chromium carbides, (3) iron carbides, (4) molybdenum carbides, (5) nickel carbides, and (6) niobium carbides. The material is presented as a short abstract with the author, corporate source, and date of publication.
P.N.F.

N73-13561 National Lending Library for Science and Technology, Boston Spa (England).
NEW HIGH TEMPERATURE MATERIALS
C. Kawashima Nov. 1972 28 p refs Transl. into ENGLISH from Taika Zairyo (Japan), no. 112, 1970 p 16-26
(NLL-RTS-7657) Avail: Natl. Lending Library, Boston Spa, Engl.: £2.70; 9 NLL photocopy coupons

The development and characteristics of reinforced composite materials are discussed. The development of new composites in which glass fiber is replaced by heat-resistant inorganic fibers or metal fibers is examined. The advanced fibrous composites are characterized by resistance to heat, high strength to weight ratio, and rigidity modulus. The application as structural materials for airframes, nose cones, rocket nozzles, combustion chambers, and reentry vehicles is recommended. Author

N73-13562* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INTUMESCENT PAINT CONTAINING NITRILE RUBBER Patent
Paul M. Sawko, inventor (to NASA) Issued 14 Nov. 1972 2 p Filed 12 Feb. 1971 Supersedes N72-11456 (10 - 02, p 0210)
(NASA-Case-ARC-10196-1; US-Patent-3,702,841; US-Patent-Appl-SN-115082; US-Patent-Class-260-2.5F) Avail: US Patent Office CSCL 11C

An intumescent agent is provided which contains paranitroaniline-bisulfate dispersed in a mixture of an acrylonitrile-butadiene copolymer and a phenolic resin. The adhesion and water resistance are both greater than intumescent agents known in the past.
Official Gazette of the U.S. Patent Office

N73-13563*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTRON PARAMAGNETIC RESONANCE STUDY OF ALINEMENT INDUCED BY MAGNETIC FIELDS IN TWO SMECTIC-A LIQUID CRYSTALS NOT EXHIBITING NEMATIC PHASES
George C. Fryburg and Edward Gelerinter (Kent State Univ.) Washington Dec. 1972 9 p refs
(NASA-TN-D-7124; E-7124) Avail: NTIS HC $3.00 CSCL 20L

Using vanadyl acetylacetonate (VAAC) as a paramagnetic probe, the molecular ordering in two smectic-A liquid crystals that do not display nematic phases were studied. Reproducible alinement was attained by slow cooling throughout the isotropic smectic-A transition in dc magnetic fields of 1.1 and 2.15 teslas. The degree of order attained is small for a smectic-A liquid crystal. Measurements were made of the variation of the average hyperfine splitting of the alined samples as a function of orientation relative to the dc magnetic field of the spectrometer. This functional dependence is in agreement with the theoretical prediction except where the viscosity of the liquid crystal becomes large enough to slow the tumbling of the VAAC, as indicated by asymmetry in the end lines of the spectrum. Author

N73-13564*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTRON PARAMAGNETIC RESONANCE STUDIES OF A VISCOUS NEMATIC LIQUID CRYSTAL: EVIDENCE COUNTER TO A SECOND-ORDER PHASE CHANGE
William E. Shutt, Edward Gelerinter, George C. Fryburg, and Curtis F. Sheley Washington Dec. 1972 12 p refs
(NASA-TN-D-7122; E-7141) Avail: NTIS HC $3.00 CSCL 11D

The ordering in a viscous, nematic, liquid crystal was studied using vanadyl acetyl acetonate and several nitroxides as paramagnetic probes. The ordering curve for VAAC at both K-band and X-band shows a slope discontinuity at a reduced temperature of 0.85. This discontinuity is caused by the tumbling time of the VAAC becoming comparable with the hyperfine splitting. The slope discontinuity is not present in the ordering curves of the nitroxides. The results are taken as evidence counter to the presence of a second-order phase transition. Author

N73-13565# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
TENSILE CREEP OF BORON/EPOXY AND BORON/EPOXY-REINFORED 7075-T6 ALUMINUM ALLOY
Daniel J. Chwirut May 1972 60 p refs
(NBS-TN-722) Avail: SOD $0.60 as C13.46:722

Tensile creep tests were performed on twelve specimens of 0 deg unidirectional boron/epoxy and on twenty-four specimens of 7075-T6 aluminum alloy reinforced with 0 deg unidirectional boron/epoxy. An analytical procedure for predicting the creep properties of composite-reinforced metals is presented. Agreement between calculated and experimental creep curves varies with test temperature. These discrepancies between experiment and analysis are probably not due to an error in the analysis itself, but rather to uncertainty in the residual stresses in the specimens. Author

N73-13566# National Bureau of Standards, Washington, D.C. Engineering Mechanics Section.
TORSIONAL INSTABILITIES IN COMPOSITE AND COMPOSITE-REINFORCED ALUMINUM-ALLOY THIN-WALLED CYLINDERS
Donald E. Marlowe Jun. 1972 77 p refs
(NBS-TN-728) Avail: SOD $0.70 as C13.46:728

The elastic buckling strength has been determined for thin-walled aluminum-alloy tubes fabricated with and without

undirectional boron/epoxy and glass/epoxy composite materials applied as reinforcement to their outer surfaces. There boron/epoxy ply orientations were investigated. The results of these tests have been compared with the buckling strengths predicted by two analytical techniques. It was found that reinforcement of the metal tubes with an equal thickness of the composite material increased the buckling strength about threefold. The effect on buckling strength of the ply angles investigated is small when compared with the overall effect of adding the reinforcement.
Author

N73-13567# Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
AN ESTIMATION OF THE PROBABILITY OF FATIGUE FAILURE OF SOME GRAPHITES
B. J. S. Wilkins and A. R. Reich Feb. 1972 25 p refs
(AECL-3958) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $1.00

Engineering design of structural ceramic components has to make allowance for fatigue failures. A method has been developed to estimate the probability of such failures. The application of this method to published data for graphites is described. The estimates obtained were very conservative because data in the literature were not in the specialized form required by the method. Nevertheless, the estimates were useful and were used to illustrate the effects of the fatigue limit and of fracture strength and its variability for POCO and RC4 graphites. Also included is a hypothetical material, Hy-POCO graphite, which is as strong as POCO but as variable as RC4 graphite. The results indicated the great importance of the fatigue limit, and that permissible service stresses are greatest for the strongest, least variable graphite. Proof testing also was desirable because, as the proof stress was increased, so was the maximum operating stress for any given probability of failure. Author (NSA)

N73-13568# Sandia Labs., Albuquerque, N.Mex.
TOUGHNESS OF BORSIC-Al COMPOSITES WITH WEAK FIBER-MATRIX BONDS
W. R. Hoover and R. E. Allred Feb. 1972 28 p refs Presented at the 4th Ann. Spring meeting of the Met. Soc. of AIME, Boston, 8 May 1972 Sponsored by AEC
(SC-DC-714467; Conf-720515-3) Avail: NTIS

The toughening mechanism of crack blunting through fiber-matrix debonding in Borsic-Al composites has been examined. It was observed that a plane stress to plane strain transition in the notch tip stress state can be achieved by increasing the composite thickness to above 0.100 in. This stress state transition was found to cause a change in the fiber matrix bond fracture mechanism and the critical strength ratio for delamination. In addition, it was found that this delamination behavior renders the composite totally notch insensitive; hence, classical brittle fracture appears unimportant in this Borsic-Al composite. The observations of crack blunting through delamination and notch insensitivity are discussed in light of their effects on design.
Author (NSA)

N73-13569# Defence Research Information Centre, Orpington (England).
THE CHEMICAL MECHANISM DURING THE REACTION SINTERING OF SILICON-SILICON CARBIDE. COMPOSITIONS IN A MEDIUM OF CARBON MONOXIDE AND NITROGEN
E. P. Sadkovskii Jul. 1972 8 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Neorg. Mater. (Moscow), v. 4, no. 7, 1968 p 1186-1188
(AD-747718; DRIC-Trans-2768; BR30142) Avail: NTIS CSCL 11/2

The report describes the process of firing silicon-carborundum compositions in an artificially created medium of CO - N2. Samples of a finely ground mixture of silicon carbide and silicon were studied (50:50 mixture) as well as samples of silicon carbide and silicon separately. GRA

N73-13570# Army Materials and Mechanics Research Center, Watertown, Mass.
POLYPHOSPHAZENES. PART 1: SYNTHESIS OF POLY FLUOROALKOXY PHOSPHAZENES
Robert E. Singler Jun. 1972 19 p refs
(Contract DA Proj. 1T0-62105-A-329)
(AD-747344; AMMRC-TR-72-19-Pt-1) Avail: NTIS CSCL 11/10

The report describes the preparation of phosphazene elastomers. A number of phosphazene polymers have been synthesized which differ considerably in their physical properties. The first samples prepared were oils; samples prepared in the latter part of the program were high molecular weight elastomers. Ideas regarding structure, stability, and physical properties are discussed. These polymers have many desirable properties such as low cost, chemical inertness, low temperature flexibility, and good thermal properties. Author (GRA)

N73-13571# Naval Underwater Systems Center, Newport, R.I.
NONLINEAR BEHAVIOR OF TRANSDUCER CERAMICS
Charles L. LeBlanc Aug. 1972 52 p refs
(AD-748198; NUSC-TR-4295) Avail: NTIS CSCL 11/2

A compilation of the nonlinear characteristics of polarized ferroelectric ceramics in environmental conditions representative of operational situations is presented. The effects of high alternating electric fields, large static and/or dynamic stresses, and combinations of field and stress on the electromechanical parameters of several ceramic compositions are discussed. Primary emphasis is placed on variations in the free permittivity and the dielectric-loss tangent with respect to low-frequency, high-field phenomena. In the static-stress investigations, the basic parameters monitored were the permittivity and electromechanical coupling coefficient of projector materials and the piezoelectric stress and strain coefficients of receiver (hydrophone) materials. Comments concerning dynamic nonlinearities are limited to projector materials and directed at interpreting the loss mechanisms associated with large dynamic stresses experienced by ceramic specimens about their fundamental resonance frequencies.
Author (GRA)

N73-13572# Picatinny Arsenal, Dover, N.J.
ESTIMATION OF SHELF LIFE OF UNSTABILIZED POLYOLEFINS FROM THERMAL OXIDATION DATA
Leo Reich Sep. 1972 24 p refs
(AD-748827; PA-TM-2036) Avail: NTIS CSCL 11/9

The purpose of the report is to present a semi-empirical expression which, in conjunction with carbonyl formation data at elevated temperatures, may be used for extrapolation to obtain useful lifetime values of unstabilized polyolefins at ambient temperatures. Utilizing carbonyl formation data previously obtained during the thermal oxidation of unstabilized atactic polypropylene (APP), unstabilized isotactic polypropylene (IPP) and unstabilized atactic polybutene-1 (APB) along with a semi-empirical expression, it was possible to extrapolate and obtain arbitrary induction times (theta) at relatively low temperatures. Values of theta thus obtained were correlated with changes in physical properties.
Author (GRA)

N73-13573# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THERMAL CONDUCTIVITY AND DIFFUSIVITY OF INSULATION MATERIALS
D. M. Dudnik and A. N. Stepanenko 22 May 1972 9 p refs Transl. into ENGLISH from Kholodilnaya Tekh. (USSR), v. 45, no. 1, 1968 p 27-29
(AD-748748; FTD-HC-23-145-72) Avail: NTIS CSCL 11/7

The selection of a heat insulation material for protective structures must take into account a number of thermophysical properties which permit evaluating its quality and determining its area of application. Some of the basic properties of heat insulating materials are thermal conductivity and thermal diffusivity. The coefficient of thermal conductivity characterizes the heat protecting properties of the material under conditions of stationary heat conditions and depends on the nature, structure, temperature, volume weight, and moisture content of the material. Author (GRA)

N73-13574# California Univ., Berkeley. Dept. of Chemical Engineering.
TIME TEMPERATURE SUPERPOSITION IN HETEROPHASE BLOCK COPOLYMERS
A. Kaya, G. Choi, and M. Shen 1 Sep. 1972 21 p refs
(Contract N00014-69-A-0200-1053; NR Proj. 356-526)

(AD-748213; TR-1) Avail: NTIS CSCL 11/10

The viscoelastic behavior of a styrene-butadiene-styrene block copolymer was studied in order to examine the validity of the Time Temperature Superposition Principle in heterophase polymers. It is found that by using an additive model, the shift factor curve can be computed. Stress relaxation isotherms over a wide temperature range can be easily superposed into a smooth master curve with these computed shift factors. The master curve compares favorably with other mechanical data determined at long times and at a high frequency. However, it is pointed out that this apparent thermorheological simplicity is strictly valid only in the region where one of the relaxation mechanisms dominates. Dynamic mechanical data illustrating the effect of multiple relaxations are presented. Author (GRA)

N73-13575# Sylvania Electric Products, Inc., Hicksville, N.Y. High Temperature Composites Lab.

DEVELOPMENT OF PROTECTIVE COATINGS FOR COLUMBIUM ALLOYS GAS TURBINE BLADES Final Technical Report, 1 Jul. 1969 - 30 Jul. 1971

Seymour Priceman and Richard Kubick Wright-Patterson AFB, Ohio AFML Jun. 1972 154 p refs

(Contract F33615-69-C-1613; AF Proj. 7312)

(AD-748837; AFML-TR-71-172) Avail: NTIS CSCL 11/3

Four developmental cycles of candidate selection, screening test and evaluation were performed on coatings for columbium turbine blade airfoils and root sections. Candidate coatings included numerous fused silicide compositions, silicided sintered underlays, and fused silicides plus glass, ceramic, soft metal, and flame sprayed overlays. The first three developmental cycles employed thermogravimetric analysis, isothermal furnace tests, slow cyclic tests, thermal fatigue torch tests, ballistic impact plus furnace oxidation tests, and prestrain plus oxidation tests as screening criteria. Extensive coating and coating processing compatibility studies were carried out with the aim of preventing deleterious reactions between root and airfoil coatings and degradation of the substrate alloy mechanical properties. The program was concluded with a series of advanced simulated environmental tests and mechanical property evaluations. GRA

N73-13576# Army Materials and Mechanics Research Center, Watertown, Mass.

DEVELOPMENT OF A HIGH-STRENGTH BERYLLIA MATERIAL

Jacob Greenspan Jun. 1972 17 p refs Presented at the 72d Ann. Meeting of the Am. Ceram. Soc., 4 May 1970

(DA Proj. 1T0-62105-A-330)

(AD-748389; AMMRC-TR-72-16) Avail: NTIS CSCL 11/2

Beryllia powders, blended with alumina powders in minor but certain sufficient amounts, are pressure sintered at relatively low temperature to high integrity, high strength microstructure. Phase structure is duplex, but predominantly beryllia.

Author (GRA)

N73-13577# Newcastle-upon-Tyne Univ. (England). Dept. of Metallurgy.

THE BRITTLE FRACTURE OF ALLOYED ALUMINA Final Technical Report, 31 Jan. 1971 - 1 Feb. 1972

N. J. Petch, J. Congleton, and L. M. Linnett Mar. 1972 29 p refs

(Contract DAJA37-71-C-2760; DA Proj. 2O0-61102-B)

(AD-748110; ERO-E-1420) Avail: NTIS CSCL 11/2

Polycrystalline discs of pure alumina and of alumina containing 0.5 or 1.0 wt. % Cr or 1.0 wt. % Ti were prepared by vacuum hot-pressing. Band strengths were determined in vacuo at 70, 300 and 600C after outgassing in vacuo at 600C. The Cr alloys did not show any very definite evidence of an increase in strength compared to pure alumina. The Ti alloys showed weakening, but this could be due to the presence of a few large grains. Author (GRA)

N73-13578# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

HIGH TEMPERATURE OXIDATION OF SILICON CARBIDE M.S. Thesis

Warren James Miller Jun. 1972 66 p refs

(AD-748351; GAW/MC/72-11) Avail: NTIS CSCL 11/2

Thermogravimetric measurements were made for the oxidation of hot pressed silicon carbide at an oxygen pressure of 150 torr and at temperatures from 1300C to 1600C. Oxidized samples were then analyzed using X-ray, metallograph, and electron probe techniques. The oxidation rate was found to increase with temperature. The products of oxidation were a carbon oxide and a protective layer of silica. The silica was primarily amorphous with some tridymite or alpha-cristobalite. Author (GRA)

N73-13579# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.

THE ELASTIC STRESS ANALYSIS OF A BI-MATERIAL PLATE WITH A CRACK NORMAL TO THE INTERFACES

Fong-Tsu Lin May 1972 134 p refs

(Contracts N00019-72-C-0274; N00019-71-C-0323)

(AD-748299; T/AM-356; UILU-ENG-72-6004) Avail: NTIS CSCL 11/4

The elastic stress analyses of a bi-material plate with a crack approaching normally to the bi-material interfaces and with crack tips at the interfaces are studied in this investigation. The finite element method was used to analyze the problems. Strain energy release rate, G, was calculated by a potential energy method for the crack approaching normally to the interfaces. Finite element procedures and computer programs for the bi-material plate under plane stress condition were developed during the course of this investigation. The strength of stress singularity, the stress distribution (straight ahead of the crack and along the interface) are also discussed. Author (GRA)

N73-13580# Monsanto Research Corp., St. Louis, Mo.

THE ELECTRICAL AND THERMAL CONDUCTIVITY OF TWO-PHASE SYSTEMS

Lawrence E. Hielsen Aug. 1972 18 p refs

(Contract N00014-67-C-0218; ARPA Order 876; NR Proj. 356-484)

(AD-748304; HPC-72-153) Avail: NTIS CSCL 11/4

Equations from the theory of the elastic moduli of composite materials are used to calculate transport properties, such as electrical and thermal conductivities, of two-phase systems. The nature of the packing of the dispersed particles and their shape are important factors. The effect of particle shape can be incorporated into the theory as a generalized Einstein coefficient, which has been published for many shapes. The effect of particle packing can be taken care of by the maximum packing fraction, which can be experimentally measured in many cases and calculated in other cases. The theory appears to agree well with experimental results. Author (GRA)

N73-13581# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SOME REGULARITIES OF WEAKENING AND FRACTURE OF ORIENTED GLASS-REINFORCED PLASTICS DURING COMPRESSION UNDER THE CONDITIONS OF ONE-SIDED HEATING

G. E. Vishnevskii, M. G. Lozinskii, N. A. Malakhov, and V. A. Smirnov 3 Jun. 1972 19 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Mashinostr. (Moscow), no. 4, 1968 p 107-114

(AD-748526; FTD-MT-24-1834-71) Avail: NTIS CSCL 11/4

Experiments conducted on flat samples made of oriented glass-reinforced plastic EF-S on an epoxy-phenol bonding agent showed that in the investigated range of thicknesses and velocities of linear unidirectional heating during uniaxial compression in the plane of the sheet the relative breaking load on the ends of the sample is also the single-value function of the criteria of thermal similarity. A classification scheme has been proposed which characterizes the influence of the composition and deformation properties of bonding agents on the kinetics of breakdown of the samples. Author (GRA)

N73-13582# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ANTIFRICTION AND ANTIWEAR PROPERTIES OF MEDIUM PRESSURE POLYETHYLENE

M. K. Zeinalova, A. D. Mustafaev, and V. A. Mustafaev 23 Jun. 1972 11 p refs Transl. into ENGLISH from Izv. Vyssh. Vcheb. Zaved., Neft i Gaz. (Baku), v. 13, no. 5, 1970 p 97-100

(AF Proj. 7343)

(AD-748912; FTD-MT-24-2055-71) Avail: NTIS CSCL 11/9

The results of a number of investigations to determine the antifriction properties of high pressure and low pressure polyethylene have been published in literature, but there are almost no such data on medium pressure polyethylene (PSD). Presented are the results of research on the antifriction and antiwear properties of PSD. GRA

N73-13583# Naval Civil Engineering Lab., Port Hueneme, Calif.
WINDOWS FOR EXTERNAL OR INTERNAL HYDROSTATIC PRESSURE VESSELS. PART 7: EFFECT OF TEMPERATURE AND FLANGE CONFIGURATIONS ON CRITICAL PRESSURE OF 90 DEGREE CONICAL ACRYLIC WINDOWS UNDER SHORT TERM LOADING Final Report, Jun. 1969 - Jun. 1970
J. D. Stachiw and J. R. McKay Aug. 1972 35 p refs
(YF5154300801001)
(AD-748583; NCEL-TR-773-PT-7) Avail: NTIS CSCL 11/9

Conical acrylic windows of 90-degree included angle and 0.083 to 0.775 thickness-to-minor-diameter (t/D) ratios have been tested to ultimate failure under short-term hydrostatic loading. The ambient temperature was varied from 32F to 90F and the relationship between minor window diameter (D) and minor window cavity diameter in the flange (Df) varied from 0.970 to 1.500. The test results show that the critical pressure of identical windows at 90F is approximately 10% to 20% less than at 70F, and at 32F it is approximately 15% to 25% more than at 70F. To improve the critical pressure of 90-degree conical acrylic windows, it is recommended that such windows be designed with a window/flange mismatch ratio of D/D greater than 1.00, the exact magnitude depending on the window's t/D ratio, service, and design considerations. Author (GRA)

N73-13584# Dynatech Corp., Cambridge, Mass.
DEVELOPMENT OF THERMALLY STABLE POLYBENZIMIDAZOLE (PBI) FIBER Final Report, 8 Jun. 1970 - 16 Nov. 1971
Kenneth R. Sidman and John B. Gregory Nov. 1971 84 p refs
(Contract F33657-70-C-1156)
(AD-748248; Dynatech-1022; ASD-TR-72-50) Avail: NTIS CSCL 11/5

Textiles composed of polybenzimidazole (PBI) fibers combine superior qualities of non-flammability and comfort with functional utility. A further improvement desired in the qualities of PBI fabric is reduction of its tendency to shrink when exposed to flame and high temperature. The work reported was undertaken to develop a treatment for PBI which stabilizes it with respect to thermal shrinkage. Chemical treatment of PBI fiber or fabric which introduces chemical bonds between the basic polymer chains of PBI was found to stabilize PBI against thermal shrinkage. A treatment involving immersion of PBI in a liquid mixture of 5% chlorosulfonic acid in phosphorous oxychloride followed by heating and neutralization was found to be satisfactory. Fabric so treated is resistant to thermal shrinkage yet unchanged in strength and nonflammability. The treatment is stable to laundering. A pilot processing line for treating PBI tow was constructed and is discussed. GRA

N73-13585# Naval Ordnance Lab., White Oak, Md.
PROBLEMS IN THE ACOUSTIC DETERMINATION OF THE MODULUS OF FIBERS
Bruce Hartmann and Jacek Jarzynski 31 Jul. 1972 25 p refs
(AD-749011; NOLTR-72-149) Avail: NTIS CSCL 11/5

Equipment was built to measure the Young's modulus of fibers using ultrasonic pulses. Moduli measured on single straight strands of aluminum and copper wire are in satisfactory agreement with accepted values. However, moduli measured on carbon fiber yarns are as much as 45% lower than the static values. This difference arises because the individual filaments in the yarn are not straight but are twisted into a helix. This conclusion is verified by measurements on multiple stranded copper wire and theoretical calculations. Author (GRA)

N73-13586# Princeton Univ., N.J. Dept. of Chemical Engineering.
HIGH TEMPERATURE ELASTOMERS: GLASS TRANSITION-STRUCTURE CORRELATIONS FOR TWO SYSTEMATIC SERIES OF LINEAR POLY CARBORANE-SILOXANE S Technical Report, Sep. 1969 - Jan. 1972
John K. Gillham and M. B. Roller Jan. 1972 17 p refs
(Contract N00014-67-A-0151-0024; NR Proj. 356-504)
(AD-748931; TR-8) Avail: NTIS CSCL 11/10

Nine poly(carborane-siloxane) high temperature elastomers which differ systematically in chemical structure were investigated by Torsional Braid Analysis. The structural variations include two different carborane cage structures in the polymer chain (-CB10H10C- and -CB5H5C-) and the step-wise increase in the number of -Si(CH3)2-O- linkages associated with each cage in the repeat unit. Polydimethyl-siloxane was studied as the compositional limit of both series. The dynamic mechanical relaxations (about 1 cps) of the materials are reported. These include the melting points of the semi-crystalline polymers, and the glass transitions and secondary transitions of all the polymers. The glass transition temperatures in each series were systematized using a well known copolymer composition versus glass transition temperature relationship. Author (GRA)

N73-13587# Picatinny Arsenal, Dover, N.J.
ACTIVATED GAS PLASMA SURFACE TREATMENT OF POLYMERS FOR ADHESIVE BONDING. PART 4; TREATMENT OF THE DATA
Carolyn A. L. Westerdahl, J. Richard Hall, Michael J. Bodnar, and David W. Levi Sep. 1972 24 p refs
(AD-749253; PA-TM-2044) Avail: NTIS CSCL 11/9

A statistical treatment is given of adhesive bond strength as a function of time of plasma treatment of polymer films. For a number of polymers, a reasonably good correlation was obtained by the relation (S - S sub 0)/t = 1/(a - bt) where S is the adhesive bond strength of the treated polymer, S sub 0 is the strength of the untreated polymer, and t is the duration of the treatment. Author (GRA)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N73-13588# Research Inst. of National Defence, Stockholm (Sweden).
MAXIMUM LIKELIHOOD LINEAR FITTING WHEN BOTH VARIABLES HAVE NORMAL AND CORRELATED ERRORS
U. Ericsson Sep. 1971 21 p refs
(FOA-4-C-4474-A1) Avail: NTIS HC $3.25

A practical numeric method is needed to fit a straight line to pairs of seismological magnitudes, which are afflicted with considerable variations and measurement errors in both members of the pairs. The magnitudes are considered to be linear functions of an event generating parameter plus normally distributed errors. The distributions are assumed to be correlated between magnitudes and independent of the event parameter. Maximum likelihood fitting is then found to involve point adjustments along likelihood ellipse diameters conjugate to the fitted line. The analytical solution requires input of numerical values for the correlation coefficients and for the ratio between the standard deviations of the errors; their estimation in practice is briefly discussed. The computer calculated solution gives maximum likelihood estimates of the slope and the intercept of the fitted line, of their standard deviations, of the standard deviations of the errors, and of the undisturbed points on the fitted line.
Author

N73-13589# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NOTE ON THE GAUGE INVARIANCE AND THE CONSERVATION LAWS FOR A CLASS OF NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS
Yoiti Watanabe Oct. 1972 21 p refs
(IPPJ-138) Avail: NTIS HC $3.25

Relations between gauge invariance and the conservation laws are discussed relevant to the Korteweg-deVries equation. The techniques employed here are conventional in the realm of field theory; the canonical formalism is related to the invariant variation problem. The function of constants of motion, when represented in terms of canonical variables, is to generate infinitesimal partial gauge transformations of any order, under

which the variation problem is invariant. Examples are presented on various aspects together with the general theory. Author

N73-13590# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ON THE NONLINEAR SCHROEDINGER EQUATION FOR LANGMUIR WAVES
Burton D. Fried and Yoshi H. Ichikawa Aug. 1972 41 p refs
(IPPJ-137) Avail: NTIS HC $4.25

A direct derivation of the nonlinear Schroedinger equation for Langmuir waves is presented, based upon the nonlinear wave packet ansatz. Both fluid and Vlasov equation formulations are used. The results obtained are essentially equivalent to those found earlier using reductive perturbation theory, including the importance of wave particle resonances at the group velocity for the long time behavior of the amplitude of modulated waves. Separating the wave packet considerations from the calculation of the nonlinear frequency shift makes it possible to attack the latter with whatever method facilitates the analysis of that part of the problem. In addition, certain ambiguities concerning singularities in velocity integrations are resolved, and the connection with a well-posed initial value problem is made clearer. Author

N73-13591*# Massachusetts Inst. of Tech., Cambridge. Alfred P. Sloan School of Management.
SEMILINEAR (TOPOLOGICAL) SPACES AND APPLICATIONS Working Paper
Prem Prakash and Murat R. Sertel Jun. 1971 43 p refs Revised
(Grant NGL-22-009-309)
(NASA-CR-129591; Rept-525-71-Rev) Avail: NTIS HC $4.25 CSCL 12A

Semivector spaces are defined and some of their algebraic aspects are developed including some structure theory. These spaces are then topogized to obtain semilinear topological spaces for which a hierarchy of local convexity axioms is identified. A number of fixed point and minmax theorems for spaces with various local convexity properties are established. The spaces of concern arise naturally as various hyperspaces of linear and semilinear (topological) spaces. It is indicated briefly how all this can be applied in socio-economic analysis and optimization. Author

N73-13592*# Massachusetts Inst. of Tech., Cambridge. Alfred P. Sloan School of Management.
ORDER, TOPOLOGY AND PREFERENCE
Murat R. Sertel Oct. 1971 36 p refs
(Grant NGL-22-009-309)
(NASA-CR-129593; Rept-565-71) Avail: NTIS HC $4.00 CSCL 12A

Some standard order-related and topological notions, facts, and methods are brought to bear on central topics in the theory of preference and the theory of optimization. Consequences of connectivity are considered, especially from the viewpoint of normally preordered spaces. Examples are given showing how the theory of preference, or utility theory, can be applied to social analysis. Author

N73-13593# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automtique et de ses Applications Spatiales.
APPLICATION OF THE LEAST SQUARES METHOD TO PARAMETERIZATION [APPLICATION DE LA METHODE DES MOINDRES CARRES A LA RECHERCHE DE PARAMETRES]
J. P. Gouyon May 1972 15 p refs In FRENCH
(LAAS-NT-SIS-72-T-08) Avail: NTIS HC $3.00

A least squares method is described which determines an unknown parameter vector from measurements. This method permits identification, in the p dimension space of the vector Q of a region containing the extremity of this vector with a certain probability (95%). The problem can then be solved by means of the estimation of confidence intervals, and this method has led to the development of computer programs which can be applied to 3, 4, and 5 parameter cases. Author (ESRO)

N73-13594# Wisconsin Univ., Madison. Mathematics Research Center.
SPLINE APPROXIMATION AND DIFFERENCE SCHEMES FOR THE HEAT EQUATION
Vidar Thomee Jun. 1972 37 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-748774; MRC-TSR-1235) Avail: NTIS CSCL 12/1

It is proved that the spline approximation by Galerkin's method of the solution of the initial-value problem for the heat equation can be considered as the successive application of an associated finite difference operator and a spline interpolation operator. If the splines considered are of order mu, the finite difference operator is parabolic and accurate of order 2mu - 2. Some consequences of this fact are discussed. Author (GRA)

N73-13595# Wisconsin Univ., Madison. Mathematics Research Center.
MULTI-TERMINAL FLOWS IN A NETWORK
T. C. Hu Jul. 1972 42 p refs
(Contract DA-31-124-ARO(D)-462; Grant SF GJ-28339)
(AD-748773; MRC-TSR-1231) Avail: NTIS CSCL 12/2

A network consists of nodes connected by arcs. Every arc has a capacity of transmitting the flow through the arc. For a given network, there is a maximal flow between every pair of nodes acting as the source and the sink of the flow. The author considers the problems of realizability, analysis and synthesis of multi-terminal flows in the paper. Author (GRA)

N73-13596# Stanford Research Inst., Menlo Park, Calif.
A NOTE ON A SET OF FUNCTIONALS FOR SPECTRAL ANALYSES OF NON-STATIONARY PROCESSES ON A FINITE INTERVAL
R. C. McCarty and G. W. Evans, II 1971 11 p
(Contract SD-103; ARPA Order 281)
(AD-748341) Avail: NTIS CSCL 12/1

A set of functionals and their consistent estimators have been developed for the spectral analysis of continuous non-stationary random processes. The methodology is suitable for analysis of discrete parameter non-stationary processes by using appropriate summations in lieu of integrations. The methods were developed to analyze modulation frequencies in radar returns from space vehicles re-entering the earth's atmosphere. Good agreement is obtained between the spectral content of the radar returns through the use of these methods with data from other sensors. The method is most useful in determining spectral information from those processes whose frequencies change with time. Author (GRA)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N73-13597 Wisconsin Univ., Madison.
AN INTERFERENCE MODEL FOR CLOUD DISTRIBUTION FROM SATELLITE INFRARED RADIATION DATA Ph.D. Thesis
Robert Chin-Tsan Lo 1971 91 p
Avail: Univ. Microfilms Order No. 71-28999

A physical-statistical inference model is developed to estimate certain parameters of cloud distributions from empirical histograms of equivalent black body temperatures. The parameters are the percentage cloud cover of a region, the mean and variances of cloud top temperature and spectral emissivity, and the mean and variance of earth surface temperature. The empirical histograms are divided into component functions corresponding to either clear, overcast, or partly cloudy conditions observed within the satellite's fields of view. The probability distribution function of each component function is inferred through the physical relationships between the observations and cloud parameters and the application of probability distribution theory and the central limit theorem. The relationship between the statistical parameters of the component functions and the cloud parameters for several types of sky conditions are established. Nonlinear least squares technique was utilized to estimate the statistical parameters of the component functions of the histogram. Dissert. Abstr.

N73-13598# Bureau of Meteorology, Melbourne (Australia).
MONTHLY CLIMATE DATA, SURFACE, AUSTRALIA, MAY 1972
May 1972 65 p
Avail: NTIS HC $5.25

Climatological statistics most likely to meet the need of commerce, education, primary and secondary industry, research and other fields are tabulated. The mean monthly data include pressure, cloud, temperature, sunshine, rain, evaporation, and wind measurements for each district. Author

N73-13599# Bureau of Meteorology, Melbourne (Australia).
MONTHLY CLIMATE DATA, SURFACE, AUSTRALIA, APRIL 1972
Apr. 1972 70 p
Avail: NTIS HC $5.50

Climatological statistics most likely to meet the need of commerce, education, primary and secondary industry, research and other fields are tabulated. The mean monthly data include pressure, cloud, temperature, sunshine, rain evaporation, and wind measurements for each district. Author

N73-13600# National Oceanic and Atmospheric Administration, Rockville, Md.
BOMEX: ATLAS OF SATELLITE CLOUD PHOTOGRAPHS
Vance A. Myers Jul. 1971 253 p
Avail: SOD $4.25 as 0317-0063

Selected satellite cloud photographs of the BOMEX area for the period of 3 May through 28 July, 1969 are presented. The ATS 3 satellite cloud photography system and gridding procedures are described. F.O.S.

N73-13601*# New York Univ., N.Y. Dept. of Meteorology and Oceanography.
BASIC RESEARCH IN METEOROLOGY AND ATMOSPHERIC PHYSICS
Roger Opstbaum Jun. 1972 37 p refs
(Grant NGL-33-016-013)
(NASA-CR-130110) Avail: NTIS HC $4.00 CSCL 04B

A survey is reported of methods for sounding the atmospheric temperature profile by remote measurements. The emphasis for this period was placed on sounding in the microwave region of the spectrum, sounding in cloudy atmosphere, and measuring sea temperatures remotely. Summaries of the research in the following areas are included: orbital detection of stratospheric aerosols, monthly precipitation charts for the world, determining planetary cloud structure by remote polarization measurement, analysis of Mariner 6 and 7 multicolor photometric photographs of Mars, and techniques for photometric detection of extrasolar planets. F.O.S.

N73-13602# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY NO. 7, JULY 1972
28 Sep. 1972 124 p refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 7, Jul. 1972
(JPRS-57127) Avail: NTIS HC $8.25

Articles are presented on microclimatology, agricultural meteorology, weather forecasting and climate control, hydrological forecasting, the activities and personnel of the Soviet hydrometeorological service, and new publications. For individual titles, see N73-13603 through N73-13618.

N73-13603 Joint Publications Research Service, Arlington, Va.
WIND VELOCITY COMPONENTS
V. I. Gubin *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 1-5 ref (For availability see N73-13602 04-20)

Beginning with the assumption of spatial rectilinear and uniform motion of an air particle, a procedure is proposed for determining the velocity components in the Z-system. The expressions obtained for the horizontal wind components differ from the generally accepted geostrophic approximation. Author

N73-13604 Joint Publications Research Service, Arlington, Va.
ATMOSPHERIC MOTION IN EQUATORIAL LATITUDES
V. S. Purganskiy and G. R. Zakharov *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 6-17 ref (For availability see N73-13602 04-20)

A study was conducted to determine the stationary motion of the atmosphere in equatorial latitudes on the basis of the nonlinear system of the equations of hydrothermodynamics. The system of equations of motion developed from the study does not consider the dependence of the meteorological elements on the longitude nor the viscous forces. The proposed model can be used to describe a mean motion to discover a number of characteristic features connected with the strong nonlinearity of the general system of equations. Author

N73-13605 Joint Publications Research Service, Arlington, Va.
EXTREMELY WARM PERIODS BEFORE WINTER
S. T. Pagava and N. A. Sevalkina *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 18-23 (For availability see N73-13602 04-20)

The results are discussed of studying the natural synoptic seasons of the period before winter to discover the forecasting indications of an extremely warm season. Author

N73-13606 Joint Publications Research Service, Arlington, Va.
VARIABILITY OF THE TEMPERATURE FIELD OF THE TROPOSPHERE, STRATOSPHERE AND MESOSPHERE IN THE WINTER c13
I. V. Bugayeva, L. A. Ryazanova, and D. A. Tarasenko *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 24-29 refs (For availability see N73-13602 04-20)

A study was made of the variations of the temperature conditions of various layers of the atmosphere during the cold period by the data from the stations on Kheysa Island (80 deg north latitude), Fort Churchill (59 deg north latitude), Volgograd (48 deg north latitude), Wallops Island (38 deg north latitude) and White Sands (32 deg north latitude) for the period from 1965 to 1970. The basic purpose of the study was to determine the interrelation of the temperature conditions of various layers of the atmosphere during the periods of destruction of the zonality of circulation and the occurrence of large-scale disturbances of the baric and temperature fields. Analysis of the data for the layer of the atmosphere from the ground surface to an altitude of 80 km demonstrated that during stratospheric warmings, a clear interrelation of the temperature conditions of all the layers is observed. The warming in the stratosphere is accompanied by cooling in the troposphere and mesosphere. Author

N73-13607 Joint Publications Research Service, Arlington, Va.
ALTITUDE AND TEMPERATURE OF THE TROPOPAUSE OVER THE NORTHERN HEMISPHERE c13
Z. M. Makhover *In its* Meteorology and Hydrol., No. 7, Jun. 1972 28 Sep. 1972 p 30-39 refs (For availability see N73-13602 04-20)

The mean distribution maps were constructed according to the 1957-1965 observation data for the altitude and temperature of the lower boundary of the tropopause over the Northern Hemisphere. The characteristic features of the regime of the polar and tropical tropopause in January and July are analyzed. Author

N73-13608 Joint Publications Research Service, Arlington, Va.
STUDY OF THE APPLICABILITY OF VARIOUS LAWS OF THE STATISTICS OF EXTREMAL VALUES FOR APPROXIMATING THE EMPIRICAL DISTRIBUTIONS OF MAXIMUM WIND VELOCITIES
D. M. Belenkiy and L. V. Shagal *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 40-46 refs (For availability see N73-13602 04-20)

A study was made of the possibility of approximating the empirical distributions of the maximum wind velocities by three distribution laws of the extremal terms of a sample. It is demonstrated that in the given case it is necessary to use the distribution laws of the extremal terms of the type I sample. The hypothesis of uniformity of the readings of the meteorological stations located under similar geographic conditions is advanced and proved by means of the Ter-Mkrtchyan criterion at individual points. Author

N73-13609 Joint Publications Research Service, Arlington, Va.
LIGHT AND ULTRAVIOLET ALBEDO OF SOME NATURAL

UNDERLYING SURFACES c13
M. P. Garadzha and T. V. Yevnevich *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 47-56 refs (For availability see N73-13602 04-20)

On the basis of measurements, data were obtained on the albedo of grass and snow in the entire spectrum and in the visible and ultraviolet sections. A study was made of the effect of the sun altitude, the cloud cover and the state of the underlying surface on the magnitude of the albedo. The diurnal and annual behavior of the albedo and reflected radiation in the investigated segments of the spectrum are presented. Author

N73-13610 Joint Publications Research Service, Arlington, Va.
EXPERIMENT IN CLIMATIC ZONING OF THE COAST OF THE GULF OF RIGA (AS APPLIED TO CLIMATOTHERAPY)
N. S. Temnikova *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 57-67 refs (For availability see N73-13602 04-20)

An effort was made to perform a comparative analysis of the climatic and weather conditions of various parts of the coast and by means of the laws obtained to divide the coast line from Aynazhi to Mersrags into districts. The basis for the analysis was the results of many years of observations by the hydrometeorological stations of the Gulf of Riga (Mersrags, Daugavgriva and Aynazhi) fully characterizing the conditions of the general atmospheric circulation in the corresponding coastal regions. Author

N73-13611 Joint Publications Research Service, Arlington, Va.
STATISTICAL EIGENFUNCTIONS OF SEA LEVEL SURGES c13
G. V. Alekseyev and N. A. Romanov *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 68-73 refs (For availability see N73-13602 04-20)

The problem of analysis and prediction of random variations in sea level is dealt with. The method of expansion in natural orthogonal functions of the fluctuations in sea level at a defined point on the shore and variations in an integral wind field parameter over the sea is used. The joint analysis of the expansions of the level and the characteristic of the wind field is of interest in discovering the characteristic features of the development of surge and forecasting it. A method of forecasting the sea level is proposed which is based on the relation of the expansion coefficients of the fluctuations in sea level and the force parameter. The closeness of the relation is estimated by the linear correlation coefficients. The forecasting method is represented by regression equations. Author

N73-13612 Joint Publications Research Service, Arlington, Va.
LONG PERIOD WAVE PHENOMENON c13
A. L. Bondarenko *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 74-87 refs (For availability see N73-13602 04-20)

The results of studies of the mechanism of the long-wave phenomenon and the most probable causes of the formation of a long-wave are presented. The basis for the study is the theoretical calculation method in comparison to the results of observations of the process under natural conditions. The results of the studies are of interest in solving the problems of planning, designing, maintaining and operating port facilities. Author

N73-13613 Joint Publications Research Service, Arlington, Va.
EFFECT OF THE ABOVE GROUND PLANT MASS ON THE SPECTRAL CURVES OF THE BRIGHTNESS COEFFICIENTS OF THE SOLID VEGETATION SYSTEM c23
V. I. Rachkulik *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 88-91 refs (For availability see N73-13602 04-20)

A study was made of the effect of the green mass on the spectral curves of the brightness coefficients of wheat fields. The results obtained show that the nature of the spectral reflection curves of the soil-vegetation system for the given type of soil and vegetation is determined by the quantity of above-ground vegetative mass. With a relatively small amount of green mass (9-46 cwt/hectare), the spectral curves of the brightness coefficients for the wheat field had the same nature as the soil reflection curve. With an increase in the green mass to 81 cwt/hectare, the nature of the curves gradually changed, not, however, acquiring attributes characteristic of the vegetation. Only with a green mass of more than 90 cwt/hectare when the field became quite dense did the curves of the spectral brightness coefficients acquire the shape characteristic of the green plant reflection curve. Author

N73-13614 Joint Publications Research Service, Arlington, Va.
COMPARISONS OF THE NATIONAL STANDARDS FOR MEASURING SOLAR RADIATION c29
V. A. Klevantsova *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 92-94 refs (For availability see N73-13602 04-20)

Comparisons of the pyrheliometers used in the hydrometeorological services of the socialist countries as national standards for measuring solar radiation are described. The relations between the readings of the compared pyrheliometers and the readings of pyrheliometer no. 212 which is the regional standard are presented. Author

N73-13615 Joint Publications Research Service, Arlington, Va.
CONSIDERATION OF THE INSTRUMENT INERTIA WHEN MEASURING THE AIR TEMPERATURE c14
L. L. Braginskaya *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 95-103 refs (For availability see N73-13602 04-20)

A study was made of the problem of the error in measuring the air temperature by an inertial instrument. The effect of the meteorological conditions on the dispersion and the time correlation function of the temperature is investigated; a graph is presented for the correlation interval as a function of stratification under the shelter conditions and outside it. The measurement errors as a result of inertia of the instrument are estimated under various conditions of stratification of the atmosphere. It is demonstrated that as a result of the diurnal behavior of the stratification there is diurnal behavior of the error of an inertial instrument. Author

N73-13616 Joint Publications Research Service, Arlington, Va.
BOOK REVIEW: OUTLINES OF THE DEVELOPMENT OF HYDROLOGY IN THE USSR c13
P. S. Kuzin *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 104-111 (For availability see N73-13602 04-20)

The publication in which a study is made in systematic and quite detailed form of the problems of the growth and development of Soviet hydrologic science in a fifty-year period is reviewed. Author

N73-13617 Joint Publications Research Service, Arlington, Va.
BOOK REVIEW: NAVIGATIONAL HYDROMETEOROLOGY
I. G. Pchelko and D. A. Ped *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 112-114 (For availability see N73-13602 04-20)

The reviewed book is designed as a text book for students of the ship handling specialty in the middle institutions of learning of the USSR Ministry of the Maritime Fleet. It has as its goal to acquaint the students with the principles of studying physical processes and phenomena occurring in the atmosphere and ocean and also the use of hydrometeorological conditions on the activity of the maritime fleet. Author

N73-13618 Joint Publications Research Service, Arlington, Va.
MAIN ADMINISTRATION OF THE HYDROMETEOROLOGICAL SERVICE c08
A. N. Volosevich and Ye. M. Tsarkov *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 115-116 (For availability see N73-13602 04-20)

The PR-49 quasi-analog computer is described which was proposed for use in the main administration of the Soviet hydrometeorological service network. In contrast to the known devices for calculating the nonsteady state motion of water in the river channels, the PR-49 machine realizes nonlinear equations. It has a memory, an initial conditions input assembly, and separate charge and discharge time constants for the capacitor of the RC-elements. This permits calculation of the transformation of the water flow rates in the river channels with variable parameters which vary automatically as a function of the water flow rates in the given channel sections, establishment of the

different speeds of passage of the front and rear parts of the water and, consequently, simulation of the flood loop, automatic establishment of the RC-element parameter in accordance with the specific calculation conditions, introductions of the flow to each section of the river and realization of the equation describing the thermal processes in the ice cover. Author

N73-13619# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL CONTROL OF HYDROMETEOROLOGICAL FACTORS FOR SOLUTION OF AGROMETEOROLOGICAL PROBLEMS
A. I. Korovin 30 Nov. 1972 15 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 8, 1972 p 82-90
(JPRS-57637) Avail: NTIS HC $3.00

The solution of agrometeorological problems by the experimental modeling of hydrometeorlogical factors are studied. Author

N73-13620# RAND Corp., Santa Monica, Calif.
CLOUD FREE LINE-OF-SIGHT CALCULATIONS
R. R. Rapp and C. Schutz Sep. 1972 28 p refs
(P-4883) Avail: NTIS HC $3.50

A method is reported for computing the probability of having a cloudfree line-of-sight (CFLOS) to or from a given point on the earth, using 3-hourly synoptic weather reports of clouds. The method is based on whole sky photographs taken during daylight hours over a period of three years at Columbia, Missouri. The computational procedure is an effort to eliminate an apparent oversimplification that results from the use of mean cloud cover, an unrelated vertical cloud distribution, and sunshine data. Present results are at variance with earlier estimates, but compatible with recent observations actually taken from aircraft. The range of uncertainty was estimated by using published empirical data and a quantitative error analysis. Author

N73-13621*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MIXING-HEIGHT MEASUREMENT BY LIDAR, PARTICLE COUNTER, AND RAWINSONDE IN THE WILLIAMETTE VALLEY, OREGON
M. Patrick McCormick, S. Harvey Melfi, Lars E. Olsson (Oregon State Univ.), Wesley L. Tuft (Oregon State Univ.), William P. Elliott (Oregon State Univ.), and Richard Egami (Oregon State Univ.) Washington Dec. 1972 78 p refs
(NASA-TN-D-7103; L-8279) Avail: NTIS HC $3.00 CSCL 04B

The feasibility of using laser radar (lidar) to measure the spatial distribution of aerosols and water vapor in the earth's mixing or boundary layer is shown. From these data the important parameter of actual mixing height was determined, that is, the maximum height to which particulate pollutants actually mix. Data are shown for simultaneous lidar, rawinsonde, and aircraft-mounted condensation nuclei counter and temperature measurements. The synoptic meteorology is also presented. The Williamette Valley, Oregon, was chosen for the measurements because of its unique combination of meteorology, terrain, and pollutant source, along with an ongoing Oregon State University study of the natural ventilation of this valley. Author

N73-13622# Northwest Environmental Technology Labs., Inc., Bellevue, Wash.
EFFECTIVENESS OF FOG DISPERSAL TECHNIQUES AT SEATTLE-TACOMA AND SPOKANE INTERNATIONAL AIRPORTS Final Report, 12 Nov. 1971 - 10 Jul. 1972
W. G. Tank, W. T. Kreiss, J. M. Lansinger, D. R. Makela, and N. M. Barr Jul. 1972 181 p refs
(Contract DOT-FA72WA-2758)
(NETL-72-005-1; FAA-RD-72-92) Avail: NTIS HC $11.25

An evaluation of the effectiveness of airborne chemical fog dispersal techniques employed at the Seattle-Tacoma and Spokane International Airports, Washington, was conducted during the 1971-72 winter season. Measurements of meteorological and fog parameters, combined with visual and photographic observations made during a three-month field period, were subjected to interpretive analysis; the analysis resulted in the assignment of 25 percent and 57 percent effectiveness ratings for the Sea-Tac and Spokane fog dispersal programs, respectively. Immediately apparent environmental impact of these operations was judged to be minimal. A substantial body of evidence was acquired which indicates that heat is more effective than chemicals in local dissipation of both warm and cold fogs. Author

N73-13623# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 9, SEPTEMBER 1972
28 Nov. 1972 150 p refs Transl. into ENGLISH of Meteorol. i Gidrol. (Moscow), no. 9, Sep. 1972
(JPRS-57608) Avail: NTIS HC $9.50

Articles on microclimate, agricultural meteorology, weather forecasting and climate control, hydrological forecasting, the activities and personnel of the Soviet Hydrometeorological Service, and new publications are presented. Author

N73-13624# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 10, OCTOBER 1972
1 Dec. 1972 131 p refs Transl. into ENGLISH of Meteorol. i Gidrol. (Moscow), no. 10, Oct. 1972
(JPRS-57652) Avail: NTIS HC $8.75

Articles are presented on microclimate, agricultural meteorology, weather forecasting and climate control, and hydrological forecasting. Author

N73-13625# Max-Planck-Institut fuer Stromungsforschung, Gottingen (West Germany).
VERTICAL CIRCULATION OF ANTICYCLONES AT MIDDLE LATITUDES Thesis [ZUR VERTIKALZIRKULATION DER ANTIZYKLONEN DER MITTLEREN BREITEN]
Georg-Michael Peter 1972 54 p refs In GERMAN
(Rept-7/1972) Avail: NTIS HC $4.75; Max-Planck-Inst. fuer Stroemungsforsch. 15.60 DM

Theoretical investigations were carried out with regard to middle latitude cyclones. The following magnitudes were taken into account: vertical circulation, heat sources and sinks, and torques. The work is based on calculations of the individual pressure variation from the continuity equation, and the vertical velocity from the individual pressure variation over the steady fundamental equation. The calculated values of the individual pressure variation are statistically processed, and the results verified for two single cases. The vorticity equation and the first law of thermodynamics are calculated for an anticycline using its determined vertical circulation. From this, the order of magnitude of the associated heat sources and sinks, and torques, are determined. Author (ESRO)

N73-13626# Ludwig-Maximilians-Universitat, Munich (West Germany). Inst. fuer Meteorologie.
APPLICATION OF SPACE TECHNOLOGY TO THE ACQUISITION AND SUPERVISION OF CLIMATIC PARAMETERS AND AIR POLLUTANTS [DIE ANWENDUNG VON WELTRAUMTECHNIKEN AUF DIE ERFASSUNG UND UEBERWACHUNG VON KLIMAPARAMETERN UND LUFTVERUNREINIGENDEN STOFFEN]
Hans-Juergen Bolle Sep. 1972 15 p In GERMAN Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-81) Avail: NTIS HC $3.00

The possibilities of using satellites for the acquisition and monitoring of climatological parameters and air pollution data are discussed. The parameters of particular interest are: the planetary radiation budget and its space-time variations, clouds, particles, and atmospheric trace gases. Experience is available for some of these parameters from meteorological satellites. A summary is given of observation methods. A particular problem is the long constancy of the necessary radiation detectors and the comparability of results. Author (ESRO)

N73-13627# National Research Council of Canada, Ottawa (Ontario). Radio and Electrical Engineering Div.
BULLETIN OF THE RADIO AND ELECTRICAL ENGINEERING DIVISION, NATIONAL RESEARCH COUNCIL OF CANADA, VOLUME 21, NO. 3
Ethel I. Swail, ed Sep. 1971 29 p refs
(AD-746604) Avail: NTIS CSCL 04/2

Contents: The onset of Henry's Law for physical absorption of a vapor on a heterogeneous surface; Meteorological telemetry; 1415-MHz circularly polarized feed; The Belcher Islands expedition - 1971 Polarization properties of precipitiation scattering. GRA

N73-13628# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

PROBABILITY OF ENCOUNTERING THUNDERSTORMS AT 50,000 AND 60,000 FEET FOR SELECTED ROUTES OVER THE UNITED STATES

Donald D. Grantham and Arthur J. Kantor 14 Jul. 1972 16 p refs

(AF Proj. 8624)

(AD-748798; AFCRL-72-0415) Avail: NTIS CSCL 04/2

The probability of encountering cumulonimbi has been determined for the worst route, month and time that is, over the southern U.S. during July between 1600 and 1800 LST. Three transcontinental routes are examined: Miami to Los Angeles, Miami to San Francisco, and Washington D. C. to Los Angeles, distances measuring 2000, 2250, and 2030 nmi, respectively. Preliminary results indicated one encounter (within a 10-mile-wide flight path) for every 4 flights along the Miami-West Coast routes at 50,000 ft, and one for every 57 flights along the same routes at 60,000 ft. Clouds are assumed to be dome-shaped with base diameters ranging from 6.7 to 15 nmi at 50,000 ft and 6.7 to 10.5 nmi at 60,000 ft. Author (GRA)

N73-13629# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

EXTREMES OF HYDROMETEORS AT ALTITUDE FOR MIL-STD-210B

Norman Sissenwine 5 Jun. 1972 26 p refs

(AF Proj. 8624)

(AD-747482; AFCRL-AFSIG-242; AFCRL-72-0369) Avail: NTIS CSCL 04/2

Extremes of precipitation aloft--which would be exceeded with only 0.5 percent probability in the rainy tropics during the rainiest months--are mandatory for design of military equipment that must operate at altitude any place in the world. Also needed are greatest extremes at altitude which should be considered in design when equipment failure, during encounters of improbable intensities, would endanger human life. Frequency distributions of such rainfall intensities and the associated liquid water content in the precipitation and clouds are not available in the climatic inventory. By extrapolating upward, there are developed nearly instantaneous surface precipitation intensities with appropriate probabilities, utilizing available research data, four models, and tabulations of water content aloft. Complete findings are presented in a single table which includes intensities, liquid water content of precipitation, and liquid water content of cloud particles for nine levels up to 18 km for storms applicable to MIL-STD-210B design philosophy. Author (GRA)

N73-13630# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.

UVW ANEMOMETER DYNAMIC PERFORMANCE STUDY

Claude E. Duchon, Fred V. Brock, Manuel Armendariz, and James D. Horn May 1972 45 p refs

(DA Proj. 1T0-61102-B-53-A)

(AD-747341; ECOM-5440) Avail: NTIS CSCL 04/2

An experiment on the dynamic performance of UVW anemometers in the atmosphere was conducted at White Sands Missile Range. Three UVW anemometers separated by 2 meters were mounted on a horizontal bar, as was a hot-film anemometer. The center UVW anemometer was modified by increasing the moment of Inertia of the blades without altering the geometry. The simple first-order linear differential equation model for anemometer performance was shown to be inadequate when the variance transfer function based on this model was used to determine the true variance spectra from the observed variance spectra. Wind tunnel measurements were also made and show that the UVW anemometer distance constant decreases as the angle of attack of the wind increases. The field data yield distance constants for angles of attack near 90 degrees which tend to agree with the laboratory data. Author (GRA)

N73-13631# Aerospace Corp., El Segundo, Calif. Lab. Operations.

PERIODIC CHANGES IN ATMOSPHERIC VARIABILITY BETWEEN 140 AND 195 km Research Report, Jun. 1971 - Feb. 1972

Arthur B. Prag 15 Aug. 1972 29 p refs

(Contract F04701-72-C-0073)

(AD-748392; SAMSO-TR-72-205; TR-0073(3260-10)-2) Avail: NTIS CSCL 04/1

An empirical model has been constructed to account for the large atmospheric density variations observed from the drag on OV1-15 and ATS-2 between about 140 and 195 km. There are seven statistically significant temporal terms: one involving a(p), one involving the calcium plage index, an annual term, a semi-annual term, two one-third-annual terms and a local-time term. The altitude dependence for undisturbed conditions is expressed as a sum of two exponentials. It is predicted that the amplitude of the semi-annual variation will be independent of solar activity for all but the most disturbed solar conditions and that the phase of the October maximum and the January minimum will be earlier as solar activity increases. The April maximum and the July minimum will be approximately independent of solar activity. Author (GRA)

N73-13632# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SPECTRAL STRUCTURE OF TURBULENCE IN A ZONE OF THICK CONVECTIVE CLOUDS

S. M. Shmeter 2 Jun. 1972 15 p refs Transl. into ENGLISH from Russian paper

(AF Proj. 1367)

(AD-748518; FTD-MT-24-1780-71) Avail: NTIS CSCL 04/2

Measurement of the velocities of vertical air gusts in various parts of the space around clouds and within cumulonimbus clouds (CB) is shown. Averaged turbulence energy spectra, obtained with the aid of aircraft measurements, are presented for various parts of a CB zone in a range of linear gust scales from 300 to 3000 m. A divergence of these spectra from the five thirds law is noted, and some factors responsible for this divergence are suggested. Author (GRA)

N73-13633# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.

ATHENA H-004J FLIGHT 134 (12 AUGUST 1972)

Marjorie McLardie Hoidale Aug. 1972 58 p refs

(DA Proj. 1T6-65702-D-127)

(AD-749436; DR-722) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of Athena Flight 134, Vehicle H-004J, are presented for the Air Force Space and Missile Systems Organization and for ballistic studies. The data are presented in tabular and figure form. Author (GRA)

N73-13634# White Sands Missile Range, N.Mex. Atmospheric Sciences Lab.

THE 13901 LITTLE JOHN, MISSILE NO. 2172, ROUND NO. 684 AM (9 AUGUST 1972) Meteorological Data Report

Aug. 1972 14 p

(AD-749435; DR-721) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 13901 Little John, Missile Number 2172, Round Number 684 AM, are presented in tabular form. Author (GRA)

N73-13635# White Sands Missile Range, N.Mex. Atmospheric Sciences Lab.

THE 13401 HONEST JOHN, MISSILE NO. 2632, ROUND NO. 626 ROL (21 JULY 1972) Meteorological Data Report

Jul. 1972 30 p

(AD-749434; DR-720) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 13401 Honest John, Missile Number 2632, Round Number 626 ROL, are presented in tabular form. Author (GRA)

N73-13636# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.

THE 12808 LANCE, MISSILE NO. 2143, ROUND NO. 159 EPT (1 JUNE 1972) Meteorological Data Report

Jun. 1972 37 p

(DA Proj. 1T6-65702-D-127)
(AD-749429; DR-715) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12808 Lance, Missile Number 2143, Round Number 159 EPT, are presented in tabular form. Author (GRA)

N73-13637# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 13001 HONEST JOHN LASER, MISSILE NO. 205, ROUND NO. 624 ROL (2 JUNE 1972) Meteorological Data Report
Jun. 1972 43 p
(DA Proj. 1T6-65702-D-127)
(AD-749430; DR-716) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 13001 Honest John Laser, Missile Number 205, Round Number 624 ROL, are presented in tabular form. Author (GRA)

N73-13638# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 03702 HONEST JOHN, MISSILE NO. 1755, ROUND NO. 625 AML (16 JUNE 1972) Meteorological Data Report
Jun. 1972 26 p
(DA Proj. 1T6-65702-D-127)
(AD-749431; DR-717) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 03702 Honest John. Missile Number 1755, Round Number 625 AML, are presented in tabular form. Author (GRA)

N73-13639# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12801 LANCE, MISSILE NO. 2168, ROUND NO. 160 EST (21 JUNE 1972) Meteorological Data Report
Jun. 1972 64 p
(DA Proj. 1T6-65702-D-127)
(AD-749432; DR-718) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12801 Lance, Missile Number 2168, Round Number 160 EST, are presented in tabular form. Author (GRA)

N73-13640# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12808 LANCE, MISSILE NO. 2159, ROUND NO. 161 SPT (7 JULY 1972) Meteorological Data Report
Jul. 1972 37 p refs
(DA Proj. 1T6-65702-D-127)
(AD-749433; DR-719) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12808 Lance, Missile Number 2159, Round Number 161 SPT, are presented in tabular form. Author (GRA)

N73-13641# Weather Squadron (12th), Ent AFB, Colo.
THE PERSISTENCE OF MAP TYPES
Peter R. Scholefield Aug. 1972 34 p refs
(AD-749130; Tech-Paper-72-1) Avail: NTIS CSCL 04/2

12th Weather Squadron (previously 4th Weather Wing) has, for the past several years, been conducting applied research into the field of computer-derived weather map types. The aim has been to incorporate map typing techniques into a terminal forecast system. The paper is the latest in a series of technical reports on computer map typing which began with 4th Weather Wing Technical Paper 70-2. The paper uses two methods to analyze in detail the persistency of predetermined surface map types. Using six years of January MSL pressure data for the Colorado map typing window, types were assigned at three hourly intervals. The first method (GO) involves a direct count of consecutive occurrences for each type. To supplement the CONUS map typing program a second method (IO) was used in which a tally was made of consecutive occurrences of types at three and six hours before and after initial time occurrences that were separated by 12 hourly intervals. Author (GRA)

N73-13642# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A PROCEDURE FOR SELECTING DISTRIBUTION FUNCTIONS FOR CERTAIN METEOROLOGICAL ELEMENTS USING THE MINSK-22 ELECTRONIC COMPUTER
A. A. Dmitriev, V. S. Komarov, and Z. T. Ovechkina 14 Jul. 1972 17 p refs Transl. into ENGLISH from Tr. Nauchn.-Issled. Inst. Aeroklimatologii (Moscow), no. 62, 1970 p 106-114
(AD-749588; FTD-HT-23-1011-72) Avail: NTIS CSCL 04/2

The broad introduction of statistical methods into meteorology requires a study of the distribution of recurrences of individual meteorological elements by graduations, described by differential distribution laws (DDL). For DDL one of the coauthors has proposed a system consisting of a linear combination of exponents having advantage over others in that it is easy to integrate and differentiate. An algorithm for selecting the parameters for two functions from the mentioned system is examined. Author (GRA)

N73-13840* Barringer Research Ltd., Rexdale (Ontario).
POSSIBILITIES OF OBSERVING AIR POLLUTION FROM ORBITAL ALTITUDES
A. Barringer *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 121-139 refs (For availability see N73-13829 04-30)
CSCL 04B

N73-13869* Wisconsin Univ., Madison. Space Science and Engineering Center.
BENEFITS TO BE DERIVED FROM METEOROLOGICAL SATELLITE TECHNOLOGY
Delbert D. Smith *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 423-429 (For availability see N73-13829 04-30)
CSCL 04B

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N73-13643* Massachusetts Inst. of Tech., Cambridge.
DISPLAY RESEARCH COLLISION WARNING SYSTEM Patent
Renwick E. Curry, Laurence R. Young, Thomas Basil Smith, III, and John Rawson, inventors (to NASA) Issued 17 Oct. 1972 6 p Filed 25 Jun. 1971 Supersedes N72-11527 (10 - 02, p 0219 Sponsored by NASA
(NASA-Case-HQN-10703; US-Patent-3,699,511; US-Patent-Appl-SN-156724; US-Patent-Class-340-27NA; US-Patent-Class-340-33; US-Patent-Class-340-97; US-Patent-Class-343-112CA) Avail: US Patent Office CSCL 17G

A head-up display for a PWI system is discussed. The display consists of strips of an electroluminescent tape secured above and below the windshield and above side windows of a cockpit. The strips are associated with elevation range and azimuth range sectors which are viewable by the pilot through the windshield or windows, and are located in the directions of these sectors. When a target is detected in any of the sectors by a corresponding detector the strip or strips associated with the particular sector are illuminated. The pilot's peripheral vision is sufficient to notice their illumination thereby enabling him to directly view the particular sector without reference to a display on the instrument panel. Official Gazette of the U.S. Patent Office

N73-13644* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DUAL PURPOSE MOMENTUM WHEELS FOR SPACECRAFT WITH MAGNETIC RECORDING Patent
Narsingh Deo, inventor (to NASA) Issued 10 Oct. 1972 4 p Filed 16 Apr. 1971 Supersedes N71-34591 (09 - 21, p 3455) Sponsored by NASA
(NASA-Case-NPO-11481; US-Patent-3,697,968; US-Patent-Appl-SN-134571; US-Patent-Class-340-174.1R; US-Patent-Class-74-5.22; US-Patent-Class-179-100.2A; US-Patent-Class-346-74MD; US-Patent-Class-346-138) Avail: US Patent Office CSCL 17G

A dual purpose momentum wheel apparatus is disclosed in which a conventional momentum wheel, normally utilized for altitude stabilization of spacecraft, has been modified to function as a memory system for the storage of scientific data. The

momentum wheel apparatus comprises a rotary motor mounted within a hermetically sealed drum. A momentum wheel is mounted on the motor and is adapted to rotate adjacent the interior surface of the drum. The outer periphery of the momentum wheel is coated with a magnetic material, while a plurality of read-write heads are adjustably mounted on the interior of the drum in close proximity to the magnetic periphery of the momentum wheel. Official Gazette of the U.S. Patent Office

N73-13645# National Aerospace Lab., Tokyo (Japan).
STUDY OF A ROTARY-DRIVE VIBRATORY-OUTPUT TWO-DEGREE-OF-FREEDOM GYRO
Hiroshi Yamada Jul. 1972 17 p refs In JAPANESE; ENGLISH summary
(NAL-TR-290) Avail: NTIS HC $3.00

A unique gyro using an asymmetrical rotor has been produced and tested. This gyro uses elastic suspensions for the gimbals. A dynamic gas spin bearing is also used to suspend the asymmetrical rotor. Function and theory of operation of the gyro are reported and experimental results are presented for a trial production gyro. The experimental results agreed well with theoretical descriptions. These results show the rate resolution to be of the order one times 0.001 o/s based on a unity signal-to-noise ratio and confirm the practicability of the gyro. Author

N73-13646# La Plata Univ. (Argentina).
THERMAL CONTROL OF ARTIFICIAL SATELLITES [SOBRE EL CONTROL TERMICO DE SATELITES ARTIFICIALES]
A. C. Morello and R. O. Lopez Triaca [1972] 52 p refs In SPANISH
Avail: NTIS HC $4.75

The fundamentals are studied for designing artificial satellites for thermal control. Space thermodynamics with the sources of energy to which the satellite is subjected; the techniques, and the methods for controlling orbital temperatures; and the principle effects of the space environment on the thermal materials are analyzed. An equilibrium method for calculating the temperature is applied to a satellite in a typical circular orbit. Transl. by F.O.S.

N73-13647# La Plata Univ. (Argentina).
STUDY AND PREPLANS OF A GUIDANCE SYSTEM FOR BEAM-RIDERS [ESTUDIO Y ANTEPROYECTO DE UN SISTEMA DE GUIADO POR HAZ SEGUIDOR]
Tadeo A. Hajduk, Luis E. Blanco, Renato Fabricius, and Carlos A. Zottig 1971 63 p refs In SPANISH
Avail: NTIS HC $5.25

Preplanning information concerning a guidance system for beam-riders is presented including a discussion of the results obtained by analog simulation. An analysis of the operational characteristics of the system for processing transmitted radar data for flight control is also included along with the technical aspects for installation aboard projectiles. Transl. by F.O.S.

N73-13648# North American Systems Corp., Londonderry, N.H.
INFRARED INSPECTION OF ARTCC ELECTRICAL EQUIPMENT Final Report, Apr. - Oct. 1972
Roger L. Hall and Raymond J. Lutze Oct. 1972 64 p refs
(Contract DOT-FA72WA-2908)
(C-208; FAA-RD-72-55) Avail: NTIS HC $5.25

The electrical equipment at two ARTCC's was surveyed and current maintenance procedures reviewed to evaluate the applicability of IR inspection as a preventative maintenance tool. Author

N73-13649# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DEVELOPMENT OF A DISCRETE ADDRESS BEACON SYSTEM (DABS) Quarterly Technical Summary Report, 1 Jul. - 30 Sep. 1972
1 Oct. 1972 108 p refs
(Contracts DOT-FA72WAI-261; F19628-70-C-0230; Proj. 034-241-012)
(FAA-RD-72-117; QTSR-3) Avail: NTIS HC $7.50

Studies are described which include variations of a discrete address beacon system (DABS) for small terminals, parallel approach monitoring, sensor calibration and synchronization of sensors; improved tracking of aircraft under surveillance; data link transmission rates, message formats and segmentation, message priorities, error protection techniques; and software planning. Link design and experimental hardware development reports summarize modulation and coding studies; mutual interference analyses; propagation studies and planned experiments; ATCRBS transponder bench tests; and DABS experimental facility implementation status. Author

N73-13650# Joint Publications Research Service, Arlington, Va.
APPLIED THEORY OF INERTIAL NAVIGATION
E. I. Sliv 6 Dec. 1972 149 p refs Transl. into ENGLISH of the book "Prikl. Teoriya Inertsialnoy Navigatsii" Leningrad, 1972 120 p
(JPRS-57694) Avail: NTIS HC $9.50

A review of geometrical, analytical and semi-analytical inertial navigation systems with stress on application in the shipbuilding industry. Algoritms for transformation of the information from accelerometers are derived and structural diagrams forming the information indicated and showing the parameters for motion of ships are given. Methods of construction of horizontal platforms which are invariant with the relationship to the acceleration of the moving ship are investigated. Author

N73-13651# Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.
ADVANCED CARRIER-BASED AIR TRAFFIC CONTROL Final Technical Report, 15 Mar. 1971 - 14 Jul. 1972
Keith L. Curtner, Raymond J. Kirk, Robert P. Irons, and Nelson R. Zagalsky Aug. 1972 109 p
(Contract N00014-71-C-0265; NR Proj. 215-188)
(AD-748302; F2027-FR) Avail: NTIS CSCL 17/7

A carrier-based air traffic control system which features enroute trajectory optimization and a computer-aided marshal reassignment procedure is described. Results of computer simulations of both the airborne and shipboard systems are used to demonstrate system concept feasibility. The system description is followed by system performance estimates and hardware requirements estimates. Author (GRA)

N73-13652# Federal Aviation Administration, Washington, D.C. Office of Management Systems.
AIR TRAFFIC PATTERNS FOR IFR AND VFR AVIATION, CALENDAR YEAR 1971
Jun. 1972 54 p
(AD-748901) Avail: NTIS CSCL 17/7

The report presents a detailed record of flight plans filed at flight service stations and combined station/towers as collected in a 2-percent random sample of all Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) flight plans filed in the 50 states and the ARTC area of San Juan, Puerto Rico. These data furnished the various Offices and Services of the Federal Aviation Administration with terminal and enroute air traffic activity for use in planning and management of the air traffic control system. Author (GRA)

N73-13653# Naval Postgraduate School, Monterey, Calif.
A METHOD FOR SOLUTION OF AN AIR TRAFFIC CONTROL PROBLEM
Richard H. Franke 25 Jul. 1972 21 p
(AD-749326; NPS-53FE72071A) Avail: NTIS CSCL 17/7

A method is given for computing flight plans for aircraft returning to the carrier after a mission. The basic goal is to minimize the total flight time for the landing aircraft, while maintaining various individual and interactive constraints on the aircraft. Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N73-13654*# Hughes Aircraft Co., Culver City, Calif. Aerospace Group.
DEVELOPMENT AND CHARACTERIZATION OF LUBRICANTS FOR USE NEAR NUCLEAR REACTORS IN SPACE VEHICLES Final Report, 15 May 1971 - 15 May 1972
G. L. Robinson, R. I. Akawie, M. N. Gardos, and K. C. Krening Sep. 1972 133 p refs
(Contract NAS8-25318)
(NASA-CR-123966; P72-171) Avail: NTIS HC $8.75 CSCL 18I

The synthesis and evaluation program was conducted to develop wide-temperature range lubricants suitable for use in space vehicles particularly in the vicinity of nuclear reactors. Synthetic approaches resulted in nonpolymeric, large molecular weight materials, all based on some combination of siloxane and aromatic groups. Evaluation of these materials indicated that certain tetramethyl and hexamethyl disiloxanes containing phenyl thiophenyl substituents are extremely promising with respect to radiation stability, wide temperature range, good lubricity, oxidation resistance and additive acceptance. The synthesis of fluids is discussed, and the equipment and methods used in evaluation are described, some of which were designed to evaluate micro-quantities of the synthesized lubricants. Author

N73-13655# Chalmers Univ. of Technology, Goteborg (Sweden).
ATOMIC PILE TECHNOLOGY AND THE CHEMISTRY OF SOLIDS
J. Arvid Hedvall 1971 14 p refs
(Rept-331) Avail: NTIS HC $3.00

The adsorption processes and crystal growth mechanisms of various solids used in reactor technology were examined. Studies were also made of physio-chemical properties, structural changes, and surface reactions of the solids. The LEED method and X-ray methods are discussed. E.H.W.

N73-13656*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
CONTROL FOR NUCLEAR THERMIONIC POWER SOURCE Patent Application
Craig D. Sawyer, inventor (to NASA) Filed 3 Oct. 1972 20 p Sponsored by NASA
(Contract NAS7-100)
(NASA-Case-NPO-13114-1; US-Patent-Appl-SN-294738) Avail: NTIS HC $3.00 CSCL 18E

A circuit for controlling a nuclear thermionic converter power source for space vehicles is described. The power source includes nuclear fuel interspersed with thermionic converters, a power regulator that maintains a substantially constant output voltage to a variable load, and a control circuit that drives a neutron flux regulator in accordance with the current supplied to the power regulator and the neutron, flux density in the region of the converters. The control circuit generates a control signal which is the difference between the neutron flux density and a linear function of the current, and which drives the neutron regulator in a direction to decrease or increase the neutron flux according to the polarity of the control signal. NASA

N73-13657# Oak Ridge National Lab., Tenn. Reactor Div.
ISOTOPE KILOWATT PROGRAM Quarterly Progress Report, period ending 31 Mar. 1972
A. P. Fraas and G. Samuels Jun. 1972 22 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3805) Avail: NTIS

The organic fluid capsule test continued without incident. The total operating time at the end of March was 10,685 h, of which 3600 h was accumulated since replacement of four capsules in November. The final results of the chemical analysis of the four capsules removed after 7000 h show very little decomposition or gas evolution. Construction of the quarter-scale organic fluid decomposition test loop is nearly completed. The thermoelectric module test continued until March 19 at which time a total of 4989 h of continuous operation had been accumulated. The unit was shut down to permit repair of an argon leak that developed over a period of several months. This was in the instrument header and increased to the point where repressurization was required every few days. The repair will be done with epoxy resin supplied. Author (NSA)

N73-13658# Los Alamos Scientific Lab., N.Mex.
SOURCE TERM CALCULATIONS FOR PIONEER RADIOISOTOPIC THERMOELECTRIC GENERATORS
S. E. Bronisz May 1972 15 p refs
(Contract W-7405-eng-36)
(LA-4914) Avail: NTIS

Quantities of radioactive material that would be expected to be released as the result of the exposure of a Pioneer radioisotopic thermoelectric generator to certain accident environments were calculated. The conventions used in these calculations are described, as are the reasons for choosing the conventions. The final source terms are believed to be safety conservative, but the actual degree of conservatism cannot be determined.
Author (NSA)

N73-13659# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.
STUDY OF A MAGNETIC DEVICE WITH LONGITUDINAL FIELD FOR EXPERIMENTATION WITH ADONE
B. Bartoli, D. Bisello, A. Cattoni, D. Cheng, C. Costa, F. Felicetti, P. Monacelli, A. Mulachie, M. Nigro, H. Ogren et al 20 Dec. 1971 18 p In ITALIAN
(LNF-71/90) Avail: AEC Depository Libraries

An analysis of the magnetic device for experimentation with Adone (MEA) showed that, for a relatively modest cost, it was possible to construct a second magnet, longitudinal, served by the same general installation as the MEA operating in alternation. The design of this magnetic longitudinal analyzer (MLA) is described. The MLA is compared with the MEA. Reasons for the construction of an apparatus of the MLA type are discussed, and its cost is approximated. NSA

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N73-13660* Westinghouse Electric Corp., Pittsburgh, Pa.
PHOTOTRANSISTOR IMAGING SYSTEM Patent
William F. List and David L. Farnsworth, inventors (to NASA) Issued 24 Oct. 1972 10 p Filed 19 Aug. 1971 Supersedes N72-10587 (10 - 01, p 0086) Sponsored by NASA
(NASA-Case-MFS-20809; US-Patent-3,700,961; US-Patent-Appl-SN-173185; US-Patent-Class-315-169TV; US-Patent-Class-315-169R; US-Patent-Class-317-101A) Avail: US Patent Office CSCL 20F

A phototransistor imaging system employing a mosaic of phototransistors is formed on a semiconductor substrate and operated in a charge-storage mode. A charge-storage effect occurring between the substrate and an electrical conductor interconnecting emitters of the phototransistors is used to provide a system output across a load circuit.
Official Gazette of the U.S. Patent Office

N73-13661* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
MULTISPECTRAL IMAGING SYSTEM Patent
Andrew E. Potter, Jr., inventor (to NASA) Issued 14 Nov. 1972 4 p Filed 12 May 1971 Supersedes N72-11569 (10 - 02, p 0225)
(NASA-Case-MSC-12404-1; US-Patent-3,702,735; US-Patent-Appl-SN-142662; US-Patent-Class-356-106S) Avail: US Patent Office CSCL 20F

A system is disclosed for producing multiple images of a scene where the image is viewed from a single optical system and converted to separate displays at different light wavelengths. All the images are produced simultaneously. The embodiment includes a Michelson interferometer which transmits the light intensity to a mosaic of independent light detectors. The detectors are independently coupled to an analog to digital converter which digitizes the electrical response of the detectors. The signals from the unit are stored in a memory unit and selected by a scanner unit as a function of wavelength and the increment of the detector mosaic and applied to a display device. By virtue

of the wavelength selection, different display devices are operated at different wavelengths to display the image at the selected wavelength. Official Gazette of the U.S. Patent Office

N73-13662* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVICE AND METHOD FOR DETERMINING X RAY REFLECTION EFFICIENCY OF OPTICAL SURFACES Patent
Stanley A. Fields and John M. Reynolds, inventors (to NASA) Issued 14 Nov. 1972 4 p Filed 31 Jul. 1970 Supersedes N72-15622 (10 - 06, p 0799)
(NASA-Case-MFS-20243; US-Patent-3,702,933; US-Patent-Appl-SN-59894; US-Patent-Class-250-51.5; US-Patent-Class-250-52) Avail: US Patent Office CSCL 20F

A device and method for testing the X-ray reflection efficiency and scattering properties of various optical surfaces is described. It consists of a crystal monochromator mounted to receive and diffract X-rays generated by an X-ray source. The X-rays are diffracted from the crystal so as to impinge on the optical surface being tested. The X-rays reflected by the optical surface are directed toward a detector capable of indicating the intensity of the X-rays reflected by the optical surface. Intensity readings are initially made of X-rays diffracted directly from the crystal to a detector and subsequently are made of the identical X-rays diffracted from the crystal to the optical surface and reflected to a detector. The crystal, optical surface test specimen and detectors are mounted for rotation to desired angle positions and the entire apparatus is enclosed in a vacuum chamber.
Official Gazette of the U.S. Patent Office

N73-13663*# California Univ., La Jolla. Dept. of Applied Physics and Information Science.
THE RESOLUTION OF POINT SOURCES OF LIGHT AS ANALYZED BY QUANTUM DETECTION THEORY
Carl W. Helstrom [1972] 31 p refs
(Grant NGL-05-009-079)
(NASA-CR-130129) Avail: NTIS HC $3.75 CSCL 20J

The resolvability of point sources of incoherent light is analyzed by quantum detection theory in terms of two hypothesis-testing problems. In the first, the observer must decide whether there are two sources of equal radiant power at given locations, or whether there is only one source of twice the power located midway between them. In the second problem, either one, but not both, of two point sources is radiating, and the observer must decide which it is. The decisions are based on optimum processing of the electromagnetic field at the aperture of an optical instrument. In both problems the density operators of the field under the two hypotheses do not commute. The error probabilities, determined as functions of the separation of the points and the mean number of received photons, characterize the ultimate resolvability of the sources. Author

N73-13664*# California Univ., San Diego. Dept. of Applied Physics and Information Science.
NONCOMMUTING OBSERVABLES IN QUANTUM DETECTION AND ESTIMATION THEORY
Carl W. Helstrom [1972] 31 p refs Prepared in cooperation with MIT
(Grants NGL-05-009-079; NGL-22-009-013)
(NASA-CR-129694) Avail: NTIS HC $3.75 CSCL 20J

Basing decisions and estimates on simultaneous approximate measurements of noncommuting observables in a quantum receiver is shown to be equivalent to measuring commuting projection operators on a larger Hilbert space than that of the receiver itself. The quantum-mechanical Cramer-Rao inequalities derived from right logarithmic derivatives and symmetrized logarithmic derivatives of the density operator are compared, and it is shown that the latter give superior lower bounds on the error variances of individual unbiased estimates of arrival time and carrier frequency of a coherent signal. For a suitably weighted sum of the error variances of simultaneous estimates of these, the former yield the superior lower bound under some conditions. Author

N73-13665# Weapons Research Establishment, Salisbury (Australia).
THE INFLUENCE OF TILT, CONE ANGLE AND BEAM INTENSITY CROSS SECTION ON THE COMPUTED PERFORMANCE OF NARROW BAND OPTICAL INTERFERENCE FILTERS
M. S. Brown Jul. 1972 29 p refs
(WRE-TN-710(AP)) Avail: NTIS HC $3.50

A FORTRAN 4 computer program which calculates the effective transmission and reflection coefficients for thin film filter constructions operated in nonparallel light is described. The performance of some typical narror pass band filters when operated at normal incidence and also tilted in cones of light with linear and with Gaussian intensity cross sections is analyzed. Author

N73-13666# Kyoto Univ. (Japan). Research Inst. for Fundamental Physics.
A NEW EXACT SOLUTION OF GRAVITATIONAL FIELD OF A SPINNING MASS
Akira Tomimatsu Sep. 1972 5 p refs
(RIFP-161) Avail: NTIS HC $3.00

A solution of gravitational field is presented, which reduces to one of Weyl metrics in the limit of angular momentum $J=0$ and to the Kerr metric in the limit of $J=m$ squared. Author

N73-13667# Kyoto Univ. (Japan). Research Inst. for Fundamental Physics.
GRAVITATIONAL FIELD OF SLOWLY ROTATING DEFORMED MASSES
Humitaka Sato and Akira Tomimatsu Sep. 1972 20 p refs
(RIFP-162) Avail: NTIS HC $3.00

The method that was used to generalize Schwarzschild metric into Kerr metric is applied to generalize Weyl metrics into rotating Weyl metrics, under the approximation of slow rotation that angular momentum J is much smaller than m squared, being gravitational mass. The solutions of Einstein's field equation, in empty space contain three parameters, i.e. m, J, and the deformation parameter which classifies the static Weyl metrics. Such properties of this solution as event horizon, infinite red shift surface, and quadrupole moment are discussed. Author

N73-13668# Research Inst. of National Defence, Stockholm (Sweden).
A SURVEY OF WAVE SCATTERING FROM ROUGH SURFACES
Staffan Hoeijer Sep. 1971 147 p refs
(FOA-2-C-2486-E1) Avail: NTIS HC $9.50

A survey of parts of the literature on wave scattering from rough surfaces is provided. The various methods used for analyzing rough surface scattering are presented, and more important results are given. The so-called Kirchhoff method is thoroughly discussed, as it plays a dominant role in literature. Author

N73-13669# Defence Research Establishment Ottawa (Ontario).
TARGET IDENTIFICATION BY MICROWAVE RADIOMETRY AND EXPERIMENTAL OBSERVATIONS
M. Hamid (Manitoba Univ.) Sep. 1972 73 p refs
(DREO-R-661) Avail: NTIS HC $5.75

Results of feasibility studies during the summer of 1971 indicate that the microwave radiometer technique may be effectively used for detection and identification of man-made objects such as aircraft and buildings and may offer a method to discriminate them from natural objects such as icebergs, foliage, and general terrain. As a particular application of interest the ability to identify material composition could resolve the difficult radar problem of discriminating between a ship and an iceberg. The radiometer if used in conjunction with a radar could potentially provide an extremely useful reconnaissance system. Since the radiometer technique is passive it was found to be insensitive to chaff curtains and therefore it appears feasible to determine the bearing of an aircraft attempting to screen itself with chaff. Here again the radiometer could effectively augment the function of surveillance or tracking radar system. Author

N73-13670# Institute of Nuclear Techniques, Krakow (Poland).
PHYSICS OF MAGNETISM IN SOLIDS
Krzysztof Ruebenbauer Dec. 1971 49 p refs In POLISH; ENGLISH summary
(ITJ-13) Avail: AEC Depository Libraries

The formalism of magnetic moments is discussed. Then the fundamental properites and theories of diamagnets, paramagnets, and phases with the magnetic structure are considered. The

molecular field theory, the spin wave theory, and the possibility of the coexistence of superconductivity and ferromagnetism in the correspondence with BCS theory are emphasized. The domain structure is also discussed. Finally, some experimental methods in the physics of magnetism in solids are described, such as the classical method, neutronography, EPR, NMR, and inelastic scattering of gamma rays. Author

N73-13671# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.
OPTICS OF THE MAGNETIC SPECTROMETER IN APPROXIMATIONS OF THE FIRST AND SECOND ORDERS. PART 1: THE DIFFERENTIAL EQUATION OF THE TRAJECTORY IN PRECISE FORM
G. Sanna 29 Nov. 1971 16 p refs In ITALIAN
(LNF-71/81) Avail: AEC Depository Libraries

An analysis as detailed as possible of the optical behavior of the magnetic spectrometer is presented. The differential equations of the trajectory in precise form are derived. NSA

N73-13672# Bendix Corp., Kansas City, Mo.
QUANTITATIVE STUDY OF THE SPECTRAL DISTRIBUTION OF LOW ENERGY X RAY DEVICES
R. V. Heckman May 1972 25 p refs
(Contract AT(29-1)-613)
(BDX-613-704) Avail: NTIS

A multichannel analyzer with a lithium drifted silicon detector was used to conduct a quantitative study of the spectral distribution of low energy X-ray devices. The findings of this study indicate that, as predicted by theory, X-ray tube output is proportional to the square of the voltage, and that even at low energy levels the product of current and time is a constant. The study also revealed that at energy settings below 50 kV, the average X-ray energy is closer to one-half the kilovoltage setting than to two-thirds the upper limit as is often quoted in the literature. Author

N73-13673# Scientific Research Inst. of Electro-Physical Apparatus, Leningrad (USSR).
PECULIARITIES OF FORMATION OF MAGNETIC FIELDS, SIMILAR IN A BROAD RANGE OF INDUCTIONS
V. D. Borisov, L. N. Vaulin, N. I. Doinnkov, V. A. Petrov, A. S. Simakov, and A. S. Sudarushkin 1971 24 p refs In RUSSIAN; ENGLISH summary
(NP-19359) Avail: AEC Depositor Libraries

Different methods are analysed for shaping a uniform field in electromagnets with a constant effective length in a wide operating region. The case of an asymmetric magnet yoke is considered. The analysis of magnetic characteristics and methods of their correction is made on an experimental model. The program was worked out and calculations for end fields were made under the assumption mu equals infinity. Author (NSA)

N73-13674# Aktiebolaget Atomenergi, Studsvik (Sweden).
ON THE ACTION OF A ROTATING MAGNETIC FIELD ON A CONDUCTING LIQUID
E. Dahlberg Mar. 1972 61 p refs
(AE-447) Avail: AEC Depository Libraries

A survey is presented of existing theories for the action of an applied rotating magnetic field on a conducting liquid in a circularly cylindric container. The treatment is mainly restricted to the z-independent case, which allows great simplifications but also limits the applicability. The solution for the magnetic field and the resulting forces is based on the condition that the velocity be much smaller than the peripheral velocity of the applied field. Thus these results have a much wider applicability than the subsequent velocity calculations, which only treat the purely azimuthal laminar flow that should be unstable under most experimental conditions. Author (NSA)

N73-13675# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
STUDY OF THE SECOND ORDER OF TEMPORAL COHERENCE OF AN OPTICAL FIELD WITH STEADY INTENSITY Ph.D. Thesis - Paris Univ. [ETUDE DU SECOND ORDRE DE COHERENCE TEMPORELLE D'UN CHAMP OPTIQUE A INTENSITE STATIONNAIRE]
Philippe DuReau 1972 135 p refs In FRENCH; ENGLISH summary
(ONERA-NT-196) Avail: NTIS HC $8.75

A survey is presented of the representation of optical fields, and coherence is defined. Methods for the study of temporal optical coherence are described, taking into account thermal and laser radiation. It is shown that second order coherence establishes a discrimination between thermal and the laser light. Various methods for the study of second order coherence are examined, including and intensity correlation method and a method associating a standard interferometry device with an intensity correlation interference device. The experimental design developed for this purpose is described. Author (ESRO)

N73-13676# Naval Underwater Systems Center, Newport, R.I.
DIGITAL PROCESSING OF EXPLOSIVE-SOURCE OCEAN-BOTTOM-REFLECTED ACOUSTIC SIGNALS
Salvatore R. Santaniello and Steven R. VanderVeen 9 Aug. 1972 39 p refs
(AD-748199; NUSC-TR-4337) Avail: NTIS CSCL 20/1

Low-frequency (100-Hz to 800-Hz) measurements of bottom-reflection losses in the North Pacific Ocean are discussed with respect to processing and modeling techniques. The data were acquired using shallow-depth (500-foot) explosive sound sources and a deep-depth (11,000-foot) hydrophone and were first processed on a total energy basis in 1/3-octave bands. An inverse filtering technique (deconvolution) for improving the ability to resolve sub-bottom reflections was successfully implemented and is also described. A multi-layered, absorbing, ocean bottom model was constructed and gave fair to good prediction of bottom loss. The structure of the model was determined mainly by acoustic methods where the composition was estimated from geological descriptions for the area. The model's inadequacies, particularly the importance of attenuation in low-frequency bottom-reflection prediction, are discussed.
Author (GRA)

N73-13677# Radio Corp. of America, Princeton, N.J.
EFFECTS OF TURBULENCE INSTABILITIES ON LASER PROPAGATION Quarterly Progress Report, 9 Mar. - 8 Jun. 1972
David A. DeWolf Jul. 1972 53 p refs
(Contract F30602-71-C-0356; ARPA Order 1279)
(AD-748809; PRRL-72-CR-25; RADC-TR-72-204; QPR-4) Avail: NTIS CSCL 20/6

The report reviews the contents of the three Quarterly Reports under the contract effort terminating on 8 June 1972. This discussion updates that work by comparing it with recent other work and new data. The basic results deal with the fluctuating properties of the focal area of a focused laser beam in turbulent air, viz., the average focal area for horizontal propagation, an extension of (1) to slant-path geometry, and the power spectrum of the focal-spot radius. The second part, self-contained, is a new theory of plane-wave irradiance scintillation. It contains the prediction that the log-amplitude variance is proportional to L to the minus 1/2 power ((C sub n) sub 2) to the minus 1/6 power in the saturation regime. Author (GRA)

N73-13678# Texas Univ., Austin. Applied Research Labs.
[ANALYSIS OF UNDERWATER ACOUSTIC SIGNALS AND ECHOES IN MODEL TANK] Final Report
Donald J. Shirley, Terry D. Plemons, and Loyd D. Hampton 2 Aug. 1972 42 p refs
(Contract N00014-70-A-0166-0001; NR Proj. 240-014)
(AD-748651; ARL-TR-72-28) Avail: NTIS CSCL 20/1

Presented are the preliminary results of the analysis of underwater acoustic signals generated in a model tank by a spatially distributed source with an oscillatory motion of plus or minus 1.0 degree/sec. In addition to the target motion a time variation was injected into the medium by inducting waves on the water's surface. By studying the cross-correlation matrices of various sets of signals it was concluded, under the geometry of this experiment, that target motion, and not the effects of the rough surface, is the dominating factor in causing ping-to-ping variations among certain classes of acoustic signals. However, it should be emphasized that these results are based only on this particular experimental geometry. It is very possible that under other experimental geometries the surface motion will play the dominating role of injecting a randomness into an ensemble

of acoustic signals. Suggestions for additional and more detailed research in this area are given. Author (GRA)

N73-13679# Stanford Research Inst., Menlo Park, Calif.
MATERIALS PROCESSING OF RARE EARTH-COBALT PERMANENT MAGNETS Semiannual Interim Technical Report, 1 Jul. - 31 Dec. 1972
Paul J. Jorgensen and Robert W. Bartlett Wright-Patterson AFB, Ohio AFML Apr. 1972 55 p refs
(Contract F33615-70-C-1624; ARPA Order 1617)
(AD-748264; SRI-PYU-8731; AFML-TR-72-47; SATR-3) Avail: NTIS CSCL 09/1

Materials processing of rare earth-cobalt magnets (RECo5) is being studied, including alternative methods of (1) alloy synthesis, (2) magnetic particle preparation, and (3) sintering. Evidence presented suggests that surface oxidation rather than mechanical stress is the cause of degradation in intrinsic coercivity. Apparatus using a zirconia electrochemical cell to determine the oxidation kinetics of rare earth cobalt alloys was constructed, and experiments were started on SmCo5. Appreciable oxidation rates were measured at temperatures down to 105 C. Several plasma spheroidized and plasma annealed RECo5 powder samples were sintered and magnetically evaluated.
Author (GRA)

N73-13680# Naval Research Lab., Orlando, Fla. Underwater Sound Reference Div.
BUBBLE FREQUENCIES OF AIR GUN SOURCES
Louis G. Beatty 6 Sep. 1972 12 p ref
(NRL Proj. S02-30; RF111214034471)
(AD-748586; NRL-MR-2503) Avail: NTIS CSCL 20/1

Analysis of air gun signatures indicates that the signal is sufficiently repeatable to serve as a reliable, high-level, low-frequency sound source for at-sea experiments involving the device as a calibrated source. Development of computer programs for analyzing data was significant part of this study, and the resulting program library should be helpful in future work requiring evaluation of impulse-type sound sources. Author (GRA)

N73-13681# Aerospace Research Labs., Wright-Patterson AFB, Ohio. General Physics Research Lab.
GROUP THEORY AND GENERAL RELATIVITY Interim Technical Report, Sep. 1967 - Jun. 1972
Moshe Carmeli Jun. 1972 199 p refs
(AF Proj. 7114)
(AD-749516; ARL-72-0086) Avail: NTIS CSCL 20/10

The report discusses research performed in group theory and general relativity. It includes the following: Representations of the rotation group; Representations of the Lorentz group; SL(2, C) symmetry of the gravitational field; Applications of the group SU(2) to gravitational and electromagnetic fields; Equations of motion in general relativity; and Miscellaneous.
Author (GRA)

N73-13682# Hughes Research Labs., Malibu, Calif.
LASER INDUCED DAMAGE TO NONLINEAR OPTICAL MATERIALS Final Report, 1 Jun. 1971 - 1 Jun. 1972
C. R. Giuliano and D. Y. Tseng Sep. 1972 48 p refs
(Contract F33615-71-C-1715; AF Proj. 6100)
(AD-748935; AFCRL-72-0455) Avail: NTIS CSCL 20/6

The report incorporates the results of an experimental study of laser induced damage in lithium iodate (LiIO3) and proustite (Ag3AsS3) at 1.06 and 0.694 micrometers using lasers with well-characterized output properties. The main objective of the LiIO3 investigation was to determine if a significant difference in damage threshold between phase matched (PM) and non-PM conditions for second-harmonic generation (SHG) exists. The objective of the proustite work was to measure surface damage threshold as a function of pulse repetition rate. Author (GRA)

N73-13683# Naval Weapons Center, China Lake, Calif.
THEORETICAL DESIGN OF AN INDIUM ANTIMONIDE PHOTOPARAMETRIC DETECTOR AMPLIFIER M.S. Thesis. Technical Publication, Mar. - Sep. 1969
Walter Emil Freitag Aug. 1972 73 p refs
(AD-749034; NWC-TP-5406) Avail: NTIS CSCL 17/5

The thesis discusses the feasibility of operating a photovoltaic (junction photodiode) IR (3- to 6-micron) detector with internal parametric amplification. The detector and integral parametric amplifier, called a photoparamp, offers the possibility of combining the high sensitivity of modern detectors with the very low noise characteristics of parametric amplifiers. The particular device selected for illustration is the indium antimonide photovoltaic detector. This detector is selected for its high sensitivity (D*), electrical characteristics applicable to parametric amplification, and high degree of usage in modern infrared technology. Advantages and disadvantages of photoparamp operation are explored in considerable detail. Characteristics of the detector and the required operating conditions of the parametric amplifier are developed. Noise characteristics for both the paramp and the detector are discussed, with emphasis on the interrelationships and effects of parametric operation on the detection characteristics.
Author (GRA)

N73-13684# Little (Arthur D.), Inc., Cambridge, Mass.
CHARACTERIZATION OF IR WINDOWS
John S. Haggerty and Edward T. Peters Sep. 1972 19 p refs
(Contract N00014-72-C-0092; ARPA Order 1806)
(AD-749083; ADL-74010; QTR-3) Avail: NTIS CSCL 20/6

The report includes studies on transmission electron microscopy of several of the initially received samples of GaAs crystals as well as back reflection X-ray topography of two additional lots of samples received from Bell and Howell. Transmission electron microscopy revealed evidence for the presence of very fine (-100A) defects having a density of 1 to 5 x 10 to the 17th power/cc. Preliminary calculations based on assumed metallic or dielectric properties indicate that the observed optical absorptivities at 10.6 microns could be caused by these defects.
GRA

N73-13685# Gulf Radiation Technology, San Diego, Calif.
MOLECULAR BEAM SCATTERING FROM SOLID SURFACES: A CRITICAL REVIEW
Joe N. Smith, Jr. 10 Jul. 1972 48 p refs
(Contract F44620-69-C-0034)
(AD-748938; Gulf-RT-A10997; AFOSR-72-1736TR) Avail: NTIS CSCL 20/4

The report reviews experimental studies of gas-surface scattering reported in the period from approximately 1969 through the first half of 1972. It emphasizes rare gas scattering from a variety of metal single crystals at incident energies from about 0.025 eV to nearly 20 eV, and includes a discussion of the various scattering regimes in that energy range. In addition, light gas scattering from LiF and certain highly structured metal surfaces is surveyed. The observation of single-phonon inelastic events are described. Recent studies of desorption phenomena are reviewed. A correlation of the various results is made and areas in which questions remain are indicated. Apart from parametric correlations, no attempt is made to assess the validity of the various theoretical models that have been developed to describe the scattering process. Author (GRA)

N73-13686# Case Western Reserve Univ., Cleveland, Ohio. Ultrasonics Research Lab.
A REVIEW OF ULTRASONIC VELOCITY MEASUREMENTS IN IONIC SOLUTIONS AND MOLTEN SALTS
Christopher Hall and Ernest Yeager 1 Jul. 1972 65 p refs
(Contract N00014-67-A-0404-0004; NR Proj. 384-305)
(AD-749353; TR-39) Avail: NTIS CSCL 20/1

Ultrasonic velocity measurements are the standard method for the determination of the adiabatic compressibilities of electrolytic solutions and molten salts. The review considers various methods for the measurement of acoustical velocities in such systems, fundamental thermodynamic relationships involving compressibilities and, the interpretation of velocity and compressibility measurements in simple aqueous electrolytes, non-aqueous electrolytes, systems exhibiting chemical equilibrium, and molten salt systems (both single and multiple component).
Author (GRA)

N73-13613 Joint Publications Research Service, Arlington, Va.
EFFECT OF THE ABOVE GROUND PLANT MASS ON THE SPECTRAL CURVES OF THE BRIGHTNESS COEFFICIENTS OF THE SOLID VEGETATION SYSTEM
V. I. Rachkulik *In its* Meteorology and Hydrol., No. 7, Jul.

1972 28 Sep. 1972 p 88-91 refs (For availability see N73-13602 04-20)

N73-13864* Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
POWER AND ENERGY FOR POSTERITY
Robert F. Barthelemy and Robert F. Cooper *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 355-359 (For availability see N73-13829 04-30)
CSCL 10B

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N73-13687# Instituut voor Kernphysisch Onderzoek, Amsterdam (Netherlands).
[EXPERIMENTAL AND THEORETICAL NUCLEAR PHYSICS] Progress Report, 1971 - 1972
1972 22 p refs
Avail: NTIS $3.25

Scientific accelerator studies reported cover magnetization distributions in three- and four-particle scattering measurements, analysis of the p(d,pp)n reaction using Faddeev theory and other decay in the region of intermediate neutron deficiency, and the production of I-123 for biomedical applications. Also reported is progress in planning for the construction of a 250 to 500 MeV linear electron accelerator with high duty cycle. G.G.

N73-13688*# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
EFFECT OF FILTERING ON NOISE AND TIMING IN NUCLEAR PARTICLE DETECTION
Stephen A. Gary Oct. 1970 72 p refs Sponsored in part by NASA
(Contract N00017-62-C-0604)
(NASA-CR-129613; AD-730487; APL-TG-1136) Avail: NTIS HC $5.75 CSCL 20H

The relations between signal shaping, noise, and timing resolution in nuclear particle detection systems are examined in this paper. Mathematical analysis of five commonly used types of filters leads to numerical results for system noise components arising from sources in the preamplifier, detector, and bias resistors. These results are presented in the form of design curves for the various filters, showing the dependence of each output noise component on both the magnitude of the noise sources and the filter time constants. Three of the filters considered are simple RC types; the remaining two are combinations of delay lines and RC elements. The quantitative calculations specifically assume a silicon detector and a field-effect-transistor preamplifier. Those filters that exhibit bipolar step response are analyzed in terms of crossover timing resolution, based on the earlier noise calculations. Again, the results are summarized in sets of design curves for each filter. Finally, the comparative performance of the various filter types is discussed, and specific examples are given. Author (GRA)

N73-13689# Brookhaven National Lab., Upton, N.Y. Technical Information Div.
MAGNETIC BREMSSTRAHLUNG: A NEW TOOL FOR RESEARCH
S. P. Kapitsa [1972] 20 p Transl. into ENGLISH from Priroda (Moscow), no. 10, 1971 p 22-27
(BNL-tr-480) Avail: NTIS

The research applications of magnetic bremsstrahlung and its production mechanism are reviewed. Also a storage ring facility for the production of magnetic bremsstrahlung is described. Synchrotron radiation of 10 to 10,000 eV is discussed. NSA

N73-13690# Lund Univ. (Sweden). Inst. of Technology
[ELEMENTARY PARTICLE PHYSICS RESEARCH] Annual Report, 1971
Jan. 1972 109 p refs
(LUNP-7201) Avail: AEC Depository Libraries

This annual report reviews the research carried out at the Departments of Cosmic High Energy Physics, Elementary Particle Physics, and Nuclear Physics of the University of Lund and the Lund Institute of Technology. The connections of these departments are strong with integrated research and education. They are housed in a common building, have common electronic and mechanical workshops and a common computer station. The equipment is dominated by three accelerators: a 1.2 GeV electron synchrotron, a 3 MeV Van de Graaff generator and a 0.4 MeV neutron generator. The three departments are integrated parts of a center of physics to which departments of atomic physics, electronics, mathematical physics, solid state physics and theoretical physics belong. The research of these latter departments is not reviewed here. Author (NSA)

N73-13691# International Nuclear Data Committee, Vienna (Austria).
INTERNATIONAL COOPERATION IN THE FIELD OF NUCLEAR DATA
L. Hjaerne and J. J. Schmidt [1971] 24 p refs Presented at the 22d Natl. Conf. on Nucl. Spectry. and Struct. of the Atomic Nucl., Kiev, 25-28 Jan. 1972
(INDC(NDS)-40-U; CONF-720117-1) Avail: AEC Depository Libraries

The objectives, achievements and future developments of the international cooperation in the field of nuclear data are reported. Particular emphasis is given to the international compilation, exchange, and review of neutron data important for the development of nuclear energy as a concerted effort of the four main world neutron data centers and to the role of the IAEA. A modest program for nuclear structure and reaction data was established with the aim to promote and improve the international coordination of the dispersed efforts in this nuclear data field. Author (NSA)

N73-13692# Joint Inst. for Nuclear Research, Dubna (USSR).
INFLUENCE OF METALLIC SURFACES ON THE STABILITY AND FOCUSING OF RELATIVISTIC ELECTRON RING
A. G. Bonch-Osmolovskii 30 Nov. 1972 17 p refs In RUSSIAN
(JINR-P9-6318) Avail: AEC Depository Libraries

The possibility of depressing the radiative instability and the focusing effects when compressing the relativistic electron ring in the vicinity of metallic surfaces are considered. The nature of the curvature effect on the effective index of the focusing field decay is discussed. Author (NSA)

N73-13693# Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany).
IONIZATION OF DIELECTRIC LIQUIDS BY HIGH ENERGY RADIATION STUDIED BY MEANS OF ELECTRICAL CONDUCTIVITY METHODS
A. Hummel (Interuniversitair Reactor Inst.) and W. F. Schmidt Dec. 1971 172 p refs
(HMI-B-117; IRI-133-71-19) Avail: AEC Depository Libraries

The action of high energy radiation on dielectric liquids is reviewed, especially hydrocarbons. Measurement techniques for liquid rare gases are included, while the results are presented in a general fashion. Models for the problem of track structure, spatial distribution of ions and electrons, and lifetime of ions in the track are discussed. Special attention is given to the effects of high LET radiation. The theory of transport properties was developed only for electrons and ions in rare gas liquids. NSA

N73-13694# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
X RAY SPECTROMETRY IN THE 5 TO 20A RANGE. APPLICATION TO THE EXPERIMENT ON MULTICHARGED IONS
C. Jacquot Jan. 1972 40 p refs In FRENCH, ENGLISH summary Sponsored by EURATOM
(EUR-CEA-FC-629) Avail: AEC Depository Libraries

In order to study the presence of multicharged ions in an ecr plasma, their contribution to different radiation mechanisms in the spectral range 50 to 20 A was evaluated. The efficiencies of different soft-X-ray detectors, i.e., semiconductor spectrome-

ters, crystal spectrometers, and grating spectrometers, were compared. NSA

N73-13695# Lyon Univ. (France). Inst. de Physique Nucleaire.
PIG SOURCES
T. Tauth and A. Chabert Jan. 1972 14 p refs In FRENCH
(LYCEN-7207) Avail: AEC Depository Libraries

Currently operating penning ionization gauge ion sources provide acceptable multicharged heavy ion beams. It is shown that a thorough knowledge of the physical phenomena taking place in the sources is necessary if a higher yield is to be obtained. Various types of sources (hot and cold cathodes) are reviewed and their performances given. NSA

N73-13696# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
ISOTOPIC POWER MATERIALS DEVELOPMENT Progress Report, May 1972
R. G. Donnelly Jun. 1972 14 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3865) Avail: NTIS

Research on cladding materials was directed to properties of Pt-Rh-W alloys, properties of Ir, and Ir purification. Refractory alloy investigations were conducted on Mo-base alloys. Other research is reported on compatibility of LASL-DART materials. NSA

N73-13697# Houston Univ., Tex.
PION INTERACTIONS AT MEDIUM ENERGIES Progress Report
John C. Allred and Clark Goodman 1 Jun. 1972 39 p refs
(Contract AT(40-1)-3948)
(ORO-3948-4) Avail: NTIS

Experimental and theoretical studies of nuclear structure and reaction mechanisms at intermediate energies were continued. Experiments were carried out at the Space Radiation Effects Laboratory on proton and multiple scattering and C-12 scattering in the nuclear-Coulomb interference region; pion (+) activation cross sections were also measured for several elements. An improved readout system for multiscintillator detectors was invented. A laboratory course to familiarize students with modern nuclear physics equipment was conducted. Author (NSA)

N73-13698# Oak Ridge National Lab., Tenn.
ANGULAR DISTRIBUTION OF BREMSSTRAHLUNG FROM MIRROR-CONFINED ELECTRONS
A. C. England and G. R. Haste Jun. 1972 34 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3821) Avail: NTIS

The bremsstrahlung radiation from electron - ion collisions is emitted anisotropically in directions dependent on the electron kinetic energy and the photon energy. The radiation from electrons confined in magnetic mirrors is considered here. In particular, the magnitude of this anisotropy is examined as a function of the electron energy, the photon energy, the electron pitch angle, and the angle of a detector with respect to the magnetic-mirror midplane. The calculations are performed in the Born approximation with the cross sections developed by Gluckstern and Hull. The temperature of a bi-Maxwellian distribution is calculated from the slope of the log intensity vs. photon energy curve. The effects of pitch-angle distribution and detector angle on the anisotropy of the radiation are considered. Author (NSA)

N73-13699# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.
EXPERIMENTAL INVESTIGATION OF SPACE ENERGETIC DISTRIBUTION OF PROTON LOSSES AT THE JINR SYNCHROPHASOTRON
V. Ya. Gvozdev, L. N. Zaitsev, I. F. Kolpakov, A. P. Kryachko, N. M. Nikityuk, and N. I. Pavlov 1972 24 p refs In RUSSIAN
(JINR-P16-6433) Avail: AEC Depository Libraries

It is shown that for determination of the accelerator radiation field at the effective extraction of the beam, it is necessary to know azimuthal distribution losses of protons per acceleration cycle at the moment of ejection. The detection system of particle losses at the 10 GeV synchrophasotron of JINR is described. The system consists of 20 scintillation counter scalers and controllers. The counters, located near the vacuum chamber ring, are used for counting secondary protons and pions. For calculation of primary proton losses, the corresponding calibration procedure is applied. The accuracy of measurements is about 20%. Author (NSA)

N73-13700# Los Alamos Scientific Lab., N.Mex.
AIR TRANSPORT CALCULATIONS USING THE LASLNWEF NEUTRON-GAMMA AIR FLUX TAPE AND THE NWEF COMPUTER PROGRAM CDR
J. E. Campbell (Naval Weapons Evaluation Facility) and H. A. Sandmeier 12 Nov. 1971 18 p refs Presented at Radiation Shielding Inform. Center Seminar-Workshop, Oak Ridge, Tenn., 15 Nov. 1971 Sponsored jointly by AEC and Navy
(LA-DC-13293; Conf-711125-7) Avail: NTIS

Complete transport calculations were performed in uniform, sea level air for one source neutron in each of 30 energy groups and one source photon in each of 12 energy groups. The computer program CDR (Constant Dose Range) is used to scale these results to produce ranges of constant dose from a point source of radiation in the atmosphere. A sample problem is included. NSA

N73-13701# Weapons Research Establishment, Salisbury (Australia).
ISOTOPE SEPARATION USING LASER EXCITATION
D. Kilpin Oct. 1971 15 p
(WRE-TM-494(WR/D)) Avail: AEC Depository Libraries

Laser excitation isotope separation is a feasible proposition because of the existence of isotopically specific absorption features, and the capability of matching their linewidths and positions with laser emission. Much experimental effort will be necessary to establish operable systems for isolation of the excited species. However, the concept of this separation method offers very wide choices of isotopic absorbing species, energies of radiation, reactants, and reaction conditions for economic optimisation of isotope separation. Isotope separation using laser excitation promises to provide many of the natural isotopes at costs many times less than those currently prevailing. The prospect of the heavy isotopes of carbon, nitrogen, and oxygen being available at one tenth or one hundredth of the present prices will enable widespread effective use to be made of them, particularly by chemists for mechanistic and structural studies. Author (NSA)

N73-13702# Mainz Univ. (West Germany). Inst. fuer Anorganische Chemie und Kernchemie. Zentralstelle fuer Atomkernenergie-dokumentation (ZAED), Leopoldshafen, West Ger. 3240 DM
[ACTIVITIES OF THE INSTITUT FUER ANORGANISCHE CHEMIE UND KERNCHEMIE] Annual Report, 1971 [JAHRESBERICHT DES INSTITUTS FUER ANORGANISCHE CHEMIE UND KERNCHEMIE, 1971]
M. Weber Bad Godesberg, West Ger. bundesmin. fuer bildung und wiss. Aug. 1972 165 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FBK-72-15) Avail: NTIS HC $10.25

A review of activities is given which is composed of the following parts: performance of the TRIGA reactor at Mainz; rapid chemical separations and detection of short-lived nuclides; nuclear spectroscopy, including gamma ray spectroscopy; nuclear fission; search for super-heavy elements in nature; activation analysis. Author (ESRO)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N73-13703# Technische Hogeschool, Eindhoven (Netherlands). Groep Direkte Energie Omzetting.
CLOSED CYCLE MHD SPECIALIST MEETING
L. H. Th. Rietjens, ed. Apr. 1972 36 p refs Meeting held at Eindhoven, Netherlands, 20-22 Sep. 1971
(TH-72-E-29) Avail: NTIS HC $4.00

Abstracts of the conference papers on closed cyle MHD research are presented. The general areas of discussion are the

following: results on closed cycle experiments; plasma properties, and instabilities and stabilization in nonequilibrium plasmas; loss mechanisms, current distributions, electrode effects, boundary layers, and gas dynamic effects; and design concepts of large MHD generators, and nuclear MHD power plants. N.E.N.

N73-13704*# California Univ., Los Angeles.
PHYSICAL PICTURE FOR THE ANOMALOUS PROGAGATION OF ORDINARY ELECTROMAGNETIC WAVES IN A PLASMA
Burton D. Fried Jun. 1972 11 p refs
(Grant NGL-05-007-190)
(NASA-CR-129673; IPPJ-130) Avail: NTIS HC $3.00 CSCL 20I

It is shown that the physical mechanism for the anomalous propagation of electromagnetic waves at frequencies below the plasma frequency is due to the deflection of particle thermal motions by the wave magnetic field, leading to a density perturbation which can be large when enhanced by some resonance. In presence of an external magnetic field, cyclotron resonance provides the enhancement for ordinary waves. A waveparticle resonance gives rise to anomalous propagation if the velocity distribution is anisotropic with respect to the wave vector, which allows slow electromagnetic waves, with phase velocity less than the velocity of light. Author

N73-13705# Stichting voor Fundamenteel Onderzoek der Materie, Jutphaas (Netherlands). Inst. voor Plasma-Fysica.
PRODUCTION AND MEASUREMENT OF INTENSE ION BEAMS AND BEAM-PRODUCED PLASMA IN A CUSPED MAGNETIC FIELD
Mar. 1972 87 p refs
(NP-19351; Rept-72-68) Avail: AEC Depository Libraries

Experimental work is described on the production and current measurement of intense hydrogen-ion beams in pulsed conditions (60 mA at 20 kV). In order to produce an intense beam, use is made of duoplasmatron provided with a plasma-expansion cup at anode potential. Results obtained with various configurations of grids mounted in the ion-extraction region were compared. The use of concave grids appears to be a good expedient for the production of ion beams with sufficient initial focusing to balance space-charge repulsion. Beam-current measurements were made with a Faraday collector provided with a secondary-electron suppressor. Observations show that the voltage needed to suppress the escape of secondary electrons from the collector is approximately proportional to the space-charge potential of the beam in the center of the collector entrance. Special attention was paid to the beam composition as was proved necessary in these experiments. Author (NSA)

N73-13706# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Plasma-physik.
EXPERIMENTS FOR DETERMINING THE ELECTRON DENSITY IN THE ABSORBING LAYER OF LASER-PRODUCED PLASMAS Ph.D. Thesis
W. Winkelmann Dec. 1971 52 p refs In GERMAN
(JUL-820-PP) Avail: AEC Depository Libraries

In a focused beam of a giant ruby pulsed laser, plasmas were produced through heating of thin transparent polypropylene foils. Intensity of the plasma radiation was studied on both sides of the foils within a range from 3600 to 8000 A. The existence of an optically thick medium was detected through measurement of the intensity ratios as functions of time, wavelength, radiation current of laser light, foil thickness, and angle of observation. The critical electron density, at which frequency of laser light and plasma are equal, could be surpassed; this conclusion was reached through two methods for determination of electron density. NSA

N73-13707# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
RF ELECTRIC FIELD IN AN ELECTRON ION PLASMA CONDENSER WITH AND WITHOUT A MAGNETIC FIELD: EFFECT OF HYBRID FREQUENCIES
D. Lepechinsky Feb. 1972 17 p refs In FRENCH; ENGLISH summary
(EUR-CEA-FC-638) Avail: AEC Depository Libraries

A homogeneous plasma slab is considered of constant thickness, between two parallel infinite metal plates with adjacent empty sheaths and an RF voltage applied between the plates. The resulting RF fields inside the plasma and the sheaths are calculated using the quasi-static approximation, the resonances and antiresonances of the system are found, with and without a permanent magnetic field parallel to the plates, taking into consideration a finite electron temperature and the ion motion. The work evidences the penetration of low-frequency RF fields within the plasma slab and thus the accessibility of the latter to the RF resonances in this device, making possible an RF heating of the ions (e.g., on the modified lower hybrid frequency) in the presence of an appropriate dissipative mechanism. Author (NSA)

N73-13708# Commissariat a l'Energie Atomique, Limeil-Brevannes (France). Service de Physique Generale.
INTERFEROMETRIC STUDY OF THE EXPANSION OF A PLASMA CREATED BY A LASER
Daniel Schirmann, Maxime Rabeau, Gianfranco Tonon, and Philippe Chelot Apr. 1972 64 p refs In FRENCH
(CEA-R-4299) Avail: AEC Depository Libraries

An interferometric device was used to study the expansion of a plasma from the moment when it was created by a laser until the end of the laser pulse. The device utilizes a JAMIN interferometer and is provided with an ultrahigh-speed electronic camera. A fraction of the laser beam, which creates the plasma, is used as the light source. The temporal resolution of the assembly is ensured by an exposure time of 10 to the -9th power sec, which in conjunction with a plasma expansion velocity of 10 to the 7th power cm/sec, produces a spatial resolution of 100 microns. The plasma is produced by focusing a beam, (1.06 microns) emitted by a Nd-doped glass laser (30 ns, 100 J), into a polyethylene target. The expansion of a plasma in vacuum was investigated. The effects of this expansion of inertial confinement due to the presence of residual gas, and on magnetic confinement (300 kG) were studied. Author (NSA)

N73-13709# Columbia Univ., New York.
COMPUTER SIMULATION OF SLIGHTLY COLLISIONAL PLASMAS
William Peter Gula 1972 152 p refs
(Contract AT(11-1)-3086)
(COO-3086-14) Avail: NTIS

The resistivity of a two dimensional particle-in-cell computer plasma under the influence of a steady applied electric field was studied in order to gain information about the collisional processes of such a plasma model. It was found that before the plasma goes unstable there are two distinct periods of development. At first, before electron heating occurs, the system sets up a field that weakens the applied field but does not cancel it; then, a period of linear electron temperature growth occurs. To study the effects of collisions in a plasma, a computer code was developed that incorporated collisional effects directly by using the effects of the Krook model collision operator in the kinetic equation. This code was used to investigate electron-electron collisional effects on the two stream instability. Author (NSA)

N73-13710# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Sukumi (USSR). Fiziko-Tekhnicheskii Inst.
EFFECT OF THE NONHOMOGENEITY OF A MAGNETIC FIELD ON THE HEATING OF PLASMA BY AN ELECTRON BEAM IN A MIRROR TRAP
R. A. Demirkhanov, A. K. Gevorkov, A. F. Popov, and O. A. Kolmakov 1972 32 p refs In RUSSIAN
(SFTI-1) Avail: AEC Depository Libraries

The effect of the inhomogeneity of a magnetic field on plasma heating by an electron beam in a magnetic trap of the probkotron type was experimentally investigated. The possibility of an effective linear absorption of the oscillation energy excited by the beam in the plasma in a nonhomogeneous field was demonstrated. The experimental data confirmed the mechanism of stochastic cyclotron heating of the electron component of the plasma in a mirror trap. The effectiveness of heating was maximized when the spectrum of the oscillations excited in the plasma lay in the region of cyclotron frequencies of the probkotron. Author (NSA)

N73-13711# Stevens Inst. of Tech., Hoboken, N.J. Dept. of Physics.
INVESTIGATIONS IN PLASMA DYNAMICS Annual Progress Report
George Schmidt Jun. 1972 8 p refs
(Contract AT(11-1)-3004)
(COO-3004-3) Avail: NTIS

Investigation of large-amplitude waves continued with a number of new results. The compression of E layers was also studied. Author (NSA)

N73-13712# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation.
NUMERICAL INVESTIGATIONS OF EVOLUTION OF LANGMUIR WAVE SPECTRA IN TURBULENT PLASMA
B. S. Getmanov, V. G. Makhankov, and B. G. Shchinov 1972 26 p refs In RUSSIAN
(JINR-P9-6432) Avail: AEC Depository Libraries

The behavior in time of different isotropic packets of the Langmuir waves is numerially investigated practically in all the region of the wave numbers k. The processes of induced scattering of oscillations on plasma ions and plasmon-plasmon interactions are taken into account. In the cases considered, the energy transfer is possible through a set of satellites and the diffusion-packet drift. Plasmon-plasmon interactions accelerate the packet motion to small k and also change its form. The corresponding graphs are presented. Author (NSA)

N73-13713# Royal Inst. of Tech., Stockholm (Sweden).
ON THE STABILITY OF PLASMAS PENETRATED BY NEUTRAL GAS
B. Lehnert 2 Apr. 1972 38 p refs
(TRITA-EPP-72-6) Avail: AEC Depository Libraries

The effects of plasma-neutral gas interaction, finite resistivity, and viscosity on the gravitational modes in permeable and impermeable plasmas are investigated in terms of a zero-order localized perturbation analysis. At plasma densities less than or comparable to the critical value, laboratory plasmas are permeable to neutral gas, whereas they become impermeable in the density range well above the critical value. Tokamaks belong to the class of permeable plasmas. The growth rates of ballooning modes are too slow to be distinguished from the loss rates by other mechanisms during ordinary operation of Tokamaks. When attempts are made to approach and exceed the critical density in Tokamaks, an unstable situation should arise due to a steepening of the density gradient near the plasma boundary and to the large connection length of the magnetic field lines.
Author NSA

N73-13714# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.
PLASMA PRODUCTION IN A MAGNETIC FIELD BY MEANS OF THE KINETIC ENERGY OF A GAS JET [ERZEUGUNG EINES PLASMAS IM MAGNETFELD MIT HILFE DER KINETISCHEN ENERGIE EINES GASSTRAHLES]
Siegfried Kelm Mar. 1971 36 p refs IN GERMAN; ENGLISH summary
(DLR-FB-71-43) Avail: NTIS HC $4.00 DFVLR, Porz, West Ger. 11,40 DM

A method of plasma production is described, by means of which a fraction of the kinetic energy of the gas stream is used to produce a weakly ionized nonthermal plasma in a magnetic field. The plasma parameters, which vary in flow direction are calculated by means of the general conservation laws for nonthermal plasmas under and outside the magnetic field influence. The result of the calculations is that the plasma cannot be decelerated down to a defined velocity for a pressure of 1 atm and that after leaving the magnetic field region the charged particles of the plasma recombine too fast for the same pressure. However for pressures lower than 0.1 atm these difficulties do not occur, therefore such a plasma can be used for MHD-generators. Author (ESRO)

N73-13715# Army Foreign Science and Technology Center, Charlottesville, Va.
NONSTATIONARY FLOWS OF LIQUID METALS IN MHD DEVICES
A. G. Ryabinin and A. I. Khozhainov 24 Aug. 1972 261 p refs Transl. into ENGLISH from the book "Nestatsionarnye Techeniya Zhidkikh Metallov v mgd Ustroistvakh" Leningrad, 1970 p 3-144
(AD-748745; FSTC-HT-23-2009-72) Avail: NTIS CSCL 20/9

Liquid metals, fluid dynamic properties, magnetohydrodynamics, laminar flow, magnetic fields, turbulence, mathematical models, reviews, theory, equations of motion, flow fields, USSR viscous flow, translations the book describes research in the nonstationary flow of liquid metals in the channels of conduction MHD devices with a constant magnetic field. It considers laminar modes of the liquid metal flow, for the most part. sections of the monograph are devoted to research into the integral characteristics of nonstationary turbulent magnetohydrodynamic currents. All the problem solutions considered are illustrated by comprehensive computed materials. The book is based on the research of authors recently published in the periodical press. nonstationary flows of liquid metals in MHD devices translation.
Author

N73-13716# Naval Research Lab., Washington, D.C.
TWO-DIMENSIONAL HARD CORE THETA-PINCH OBSERVATIONS OF SPIRAL STRUCTURE ASSOCIATED WITH INITIAL BREAKDOWN Interim Report
D. Cuchs, R. H. Dixon, and R. C. Elton 26 Jul. 1972 8 p refs
(AD-748587; NRL-MR-2495) Avail: NTIS CSCL 20/9

The evolution of the luminous plasma structure in a hard core theta-pinch has been studied in two dimensions (r,z). Distinct plasma spirals around the hard core are formed. In the antiparallel (B sub z) bias case the spirals coalesce due to a 3:1 axial compression. With zero bias field the plasma filaments are spiraling in the opposite sense of rotation. An axial structure of the plasma is observed to be present at the beginning of the discharge. In the theta-pinch without hard core this structure is shown to originate in the very initial preheater breakdown.
Author (GRA)

N73-13717# Polytechnic Inst. of Brooklyn, Farmingdale, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
PULSED MICROWAVE BREAKDOWN IN GASES WITH A LOW DEGREE OF PREIONIZATION
E. F. Dawson and S. Lederman Apr. 1972 37 p refs
(Contract DAHC04-69-C-0077; ARPA Order 1442)
(AD-748830; PIBAL-72-14) Avail: NTIS CSCL 20/9

The paper presents the results of experiments on microwave breakdown at an open end waveguide antenna in Air, Argon, Nitrogen, Carbon Dioxide and Methane at pressures of 0.3 and 30 Torr. The antenna was operated at 9.375 GHz under pulsed conditions at varying pulse rates. Very low degrees of preionization were obtained by adjusting to very slow pulse rates. The power needed to maintain the discharge was measured and from that the electric field strength was calculated. This was presented as a function of pressure for each gas at pulse rates ranging from 10 to 500 pulses per second. At low pulse rates, significantly higher power levels are needed to maintain the discharge. An interesting feature is the double minima observed at low pulse rates in the data for breakdown field strength as a function of pressure for Carbon Dioxide and Methane. The data were also used to calculate ionization frequency as a function of effective electric field for all give gases. Where possible, this data is compared with data reported by other investigators.
Author (GRA)

N73-13718# Naval Research Lab., Washington, D.C.
NUMERICAL STUDY OF THE GAS-ENCLOSED Z PINCH
David V. Anderson, Martin Lampe, and Wallace Manheimer Aug. 1972 21 p refs
(AD-748179; NRL-MR-2486) Avail: NTIS CSCL 20/9

The authors have developed a one-dimensional radial fluid code to study the time development and energetics of a Z-pinch embedded in a dense background hydrogen gas. The code uses a flux-corrected Lax-Weindroff algorithm to solve the one-fluid MDH equations together with the external circuit equations in a self-consistent energy - conserving way. Fractional ionization is determined by the Saha equation. Classical thermal and electrical conductivity are included at present, but anomalous transport can easily be inserted if required. Bremsstrahlung

emission and absorption is included. MDH instabilities are not included, but are studied analytically in a separate report. Preliminary results indicate that current rise-times at least one order of magnitude faster than the present Pharos circuit (about 100 micro sec) are highly desirable, and that fusion temperatures do seem possible with these faster circuits. Author (GRA)

N73-13719# Wisconsin Univ., Madison. Mathematics Research Center.

MAGNETOHYDRODYNAMIC PIPE FLOW WITH LAMINAR SEPARATION

K. B. Ranger Jun. 1972 36 p refs

(Contract DA-31-124-ARO(D)-462)

(AD-748766; MRC-TSR-1237) Avail: NTIS CSCL 20/9

A new solution is found from the M. H. D. pipe flow equations which exhibits the reverse flow phenomenon when the Hartmann number exceeds a certain critical value. The reverse flow region separates from the wall of the channel at a second higher Hartmann number, and the variation of the critical Hartmann number with changes in geometry of the boundary is discussed numerically. The induced magnetic field also demonstrates a similar phenomenon and changes its direction after the fluid velocity changes sign. The flow is also discussed in relation to its expansion in terms of the Hartmann number.

Author (GRA)

N73-13720# Rochester Univ., N.Y. Coll. of Engineering and Applied Science.

AN INVESTIGATION OF OPTIMUM CONDITIONS FOR LASER-PLASMA PRODUCTION AND HEATING FROM SOLID DEUTERIUM DROPLETS FOR INERTIALLY CONFINED PLASMA POWER GENERATION Final Report, 1 Mar. 1967 - 29 Feb. 1972

Moshe J. Lubin, John M. Sources, Edward B. Goldman, Thomas C. Bristow, and Walter Leising 3 Apr. 1972 43 p refs

(Grant AF-AFOSR-1279-67; AF Proj. 9752)

(AD-748260; AFOSR-72-1701TR) Avail: NTIS CSCL 20/9

The authors report theoretical and experimental work on the vaporization and heating of spherical overdense plasmas. Details of the required laser optics are described, together with charged particle, X-ray, and neutron diagnostics. A series of numerical experiments have been conducted to investigate the dynamics and neutron production in dense spherically symmetric plasmas. These have led to a development of scalings for energy absorption, shock strength and optimum neutron production. Similar numerical work has also been used to study the conversion of input laser radiation to output soft X-rays from an oxygen doped spherical laser plasma. The fast rise time of the calculated spectra suggests a method of producing a population inversion. Finally, the authors put forward one example of a breakeven configuration not requiring anomalous absorption.

Author (GRA)

N73-13721# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

MODE-COUPLING AND UNSTABLE IONIZATION WAVES

Alan Garscadden and Peter Bletzinger Sep. 1971 5 p refs Repr. from Proc. of the 10th Intern. Conf. on Phenomena in Ionized Gases, Oxford, 1971 p 293

(AF Proj. 7073)

(AD-748468; ARL-71-0229) Avail: NTIS CSCL 20/9

An explanation is suggested for the frequent observation of irregular ionization waves in glow discharges. A finite length positive column can only support certain eigenmodes, however in a nonlinear dispersion. the mode-coupled products of these waves no longer satisfy the boundary conditions. Experimental observations are presented supporting this model.

Author (GRA)

N73-13722# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

EFFECTS OF TIME AVERAGING SPECTRAL LINE INTENSITIES IN THE PRESENCE OF ELECTRON TEMPERATURE FLUCTUATIONS

Alan Garscadden and Robert F. Weber Sep. 1971 5 p refs Repr. from Proc. of the 10th Intern. Conf. on Phenomena in Ionized Gases (Oxford), 1971 p 405

(AF Proj. 7073)

(AD-748474; ARL-71-0231) Avail: NTIS CSCL 20/9

An analysis is presented showing the resulting errors of time-averaged monochromator and polychromator line intensity measurements in the presence of electron temperature fluctuations. Author (GRA)

N73-13723# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

TURBULENT IONIZATION WAVES IN CO AND CO MIXTURES

Peter Bletzinger and Alan Garscadden Sep. 1971 5 p refs Repr. from Proc. of 10th Intern. Conf. on Phenomena in Ionized Gases (Oxford), 1971 p 294

(AF Proj. 7073)

(AD-748470; ARL-71-0230) Avail: NTIS CSCL 20/9

Measurements are reported on the dispersion characteristics of plasma instabilities in a carbon monoxide plasma. Using correlation methods, it was determined that the instabilities are cathode to anode directed forward waves, with little dispersion but broad bandwidth. It is suggested that the entrainment of the noise by an external source, at as high a frequency as possible, can be useful to reduce the influence of discharge fluctuations on the CO laser output. Author (GRA)

N73-13724# Whittaker Corp., Waltham, Mass. Space Sciences Div.

CHEMICAL ADDITIVES AND DIAGNOSTICS FOR HIGH TEMPERATURE AIR PLASMAS Final Report, 23 Oct. 1970 - 22 Oct. 1971

Sol Aisenberg and Kuo Wei Chang Nov. 1971 50 p refs

(Contract F19628-71-C-0077; AF Proj. 4642)

(AD-748469; SSD-P-651-FR; AFCRL-72-0354) Avail: NTIS CSCL 20/14

The behavior of various low boiling-point, electrophilic chemical additives in a nitrogen-oxygen plasma was studied by using a K-band microwave horn probe and an S-band stripline probe. Test results show that Freon 113, Freon C-51-12, trichloroethylene, and carbon tetrachloride, which previously have been found to be excellent additives for the enhancement of microwave transmission through an argon plasma, are also very effective in removing free electrons and improving microwave transmission through the nitrogen-oxygen plasma. The principles of operation of the K-band microwave horn system and the S-band stripline diagnostic system are briefly discussed. Flight data obtained from a two-coil conductivity probe constructed under the previous contract for the measurement of plasma electrical conductivity of a re-entry nose cone were analyzed.

Author (GRA)

N73-13725# Rochester Univ., N.Y. Dept. of Mechanical and Aerospace Sciences.

FIFTEENTH MEETING OF AFOSR CONTRACTORS AND GRANTEES IN PHYSICAL ENERGETICS

Moshe J. Lubin 1972 166 p refs Meeting held at Rochester, N. Y., 7-9 Jun. 1972

(Grant AF-AFOSR-1279-67)

(AD-748265; AFOSR-72-1707TR) Avail: NTIS CSCL 20/9

The purpose of the conference is to exchange the latest information on research in non-chemical energy sources, release mechanisms and conversion processes, especially in the areas of plasma physics and nuclear fusion. GRA

N73-13726# Texas Univ., Austin. Electronics Research Center.

A FAR INFRARED SPECTROSCOPIC SYSTEM FOR PLASMA DIAGNOSTICS

Bernard A. McNulty and S. S. Sesnic 1 Jun. 1972 83 p refs

(Contract F44620-71-C-0091)

(AD-748280; TM-35; AFOSR-72-1195TR) Avail: NTIS CSCL 20/9

The far infrared portion of the electromagnetic spectrum has, until very recently, been the least accessible to experimentalists in the field of plasma diagnostics. Within the last decade, the availability of fast, sensitive detectors, known calibration sources, and rapid advancement in the field of fusion plasma research, have made the far infrared region quite viable and attractive in diagnostics. By far the most versatile and useful instrument in this area is the vacuum grating spectrometer. Thus a far-

infrared spectroscopic system, the heart of which is a vacuum grating spectrometer, was built for plasma spectroscopy studies on the Texas Tokamak. The work described here specifies the system and defines some of the more important operating characteristics of the spectrometer. Author (GRA)

N73-13727# Naval Postgraduate School, Monterey, Calif.
THE ABSORPTION OF LASER RADIATION BY A LASER PRODUCED PLASMA M.S. Thesis
Dean Masao Kunihiro Jun. 1972 42 p refs
(AD-749043) Avail: NTIS CSCL 20/9

Intense, Q-switched, neodynium laser pulses (1-9 joules), were focused into a vacuum chamber containing 5 mil and .5 mil Mylar targets to investigate the absorption of laser radiation by the subsequent plasma produced. Absolute measurements of the incident and transmitted laser energies were obtained for various background pressures and incident beam intensities. Author (GRA)

N73-13728# Naval Research Lab., Washington, D.C.
THE EFFECT OF A SURROUNDING GAS ON MHD INSTABILITIES IN A Z-PINCH
Wallace Manheimer, Martin Lampe, and Jay Boris Aug. 1972 39 p refs
(AD-748985; NRL-MR-2485) Avail: NTIS CSCL 20/9

The effect of an ionized or unionized background on MHD instabilities in a Z-pinch is considered. It is shown that the growth rate may be reduced by at least one or two orders of magnitude even though the background pressure is very small compared to the pinch pressure. The stabilizing effect of launching shocks in the background gas is considered qualitatively. It is shown that it is possible to construct equilibria such that the Lawson condition can be satisfied. Also, it is shown that lighting discharges are stabilized by the presence of the background atmosphere. Author (GRA)

N73-13729# Polytechnic Inst. of Brooklyn, N.Y.
RESEARCH OF AEROPHYSICS INSTITUTE FOR STRATEGIC TECHNOLOGY Semiannual Technical Summary Report, period ending 29 Feb. 1972
Martin H. Bloom 29 Feb. 1972 30 p refs
(Contract DAHC04-69-C-0077; ARPA Order 1442)
(AD-749287; PIBAL-72-A; AROD-8677-28-P) Avail: NTIS CSCL 20/9

The report contains a description of the technical problem areas and accomplishments achieved during the reporting period. In addition, a complete list of publications, presentations, lectures, etc. is included and the personnel associated with the program are listed. The research projects are in the general subject areas of fluid and plasma dynamics. Author (GRA)

26 PHYSICS, SOLID STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N73-13730*# Delaware Univ., Newark. Dept. of Physics.
PHOTOEMF IN CADMIUM SULFIDE Final Report
K. W. Boer 31 Dec. 1971 55 p refs
(Grant NGR-08-001-028)
(NASA-CR-129675) Avail: NTIS HC $4.75 CSCL 20B

Theoretical and experimental investigations on CdS single crystals and CuxS:CdS photovoltaic cells prepared from CdS single crystals by a chemical-dip procedure are described. The studies are aimed at clarifying cell mechanisms which affect key cell properties (efficiency, reliability, and lifetime) by examining the properties of intrinsic and extrinsic defects in the junction and surface regions and their effects on carrier transport through these regions. The experimental research described includes studies of thermal, infrared, and field quenching of acceptor-doped CdS crystals; investigation of optical and electrical properties of CuxS:CdS photovoltaic cells (current-voltage characteristics, spectral distribution of photocurrent and photovoltage) and the dependence of these properties on temperature and light intensity; measurement of changes, as a result of heat treatment in ultrahigh vacuum, in the spectral distribution of photoconductivity at room temperature and liquid nitrogen temperature, the luminescence spectrum at liquid nitrogen temperature, and the thermally stimulated current curves of CdS crystals; determination of the effect of irradiation with 150 keV (maximum) X-rays on the spectral distribution of photoconductivity and thermally-stimulated current of CdS crystals; and studies of the effect of growth conditions on the photoconductive properties of CdS crystals. Author

N73-13731*# Westinghouse Electric Corp., Pittsburgh, Pa.
INVESTIGATION OF SUPERCONDUCTING INTERACTIONS AND AMORPHOUS SEMICONDUCTORS Final Report
M. A. Janocko, C. K. Jones, J. R. Gavaler, D. W. Deis, M. Ashkin, M. P. Mathur, and J. E. Bauerle Oct. 1972 245 p refs
(Contract NASw-1760)
(NASA-CR-129524) Avail: NTIS HC $14.25 CSCL 20L

Research papers on superconducting interactions and properties and on amorphous materials are presented. The search for new superconductors with improved properties was largely concentrated on the study of properties of thin films. An experimental investigation of interaction mechanisms revealed no new superconductivity mechanism. The properties of high transition temperature, type 2 materials prepared in thin film form were studied. A pulsed field solenoid capable of providing fields in excess of 300 kOe was developed. Preliminary X-ray measurements were made of V3Si to determine the behavior of cell constant deformation versus pressure up to 98 kilobars. The electrical properties of amorphous semiconducting materials and bulk and thin film devices, and of amorphous magnetic materials were investigated for developing radiation hard, inexpensive switches and memory elements. N.E.N.

N73-13732*# Radio Corp. of America, Princeton, N.J.
DESIGN, PROCESSING, AND TESTING OF LSI ARRAYS FOR SPACE STATION
W. R. Lile and R. J. Hollingsworth Oct. 1972 35 p refs
(Contract NAS12-2207)
(NASA-CR-123943; PRRL-72-CR-44; QTR-8) Avail: NTIS HC $3.75 CSCL 20L

The design of a MOS 256-bit Random Access Memory (RAM) is discussed. Technological achievements comprise computer simulations that accurately predict performance; aluminum-gate COS/MOS devices including a 256-bit RAM with current sensing; and a silicon-gate process that is being used in the construction of a 256-bit RAM with voltage sensing. The Si-gate process increases speed by reducing the overlap capacitance between gate and source-drain, thus reducing the crossover capacitance and allowing shorter interconnections. The design of a Si-gate RAM, which is pin-for-pin compatible with an RCA bulk silicon COS/MOS memory (type TA 5974), is discussed in full. The Integrated Circuit Tester (ICT) is limited to dc evaluation, but the diagnostics and data collecting are under computer control. The Silicon-on-Sapphire Memory Evaluator (SOS-ME, previously called SOS Memory Exerciser) measures power supply drain and performs a minimum number of tests to establish operation of the memory devices. The Macrodata MD-100 is a microprogrammable tester which has capabilities of extensive testing at speeds up to 5 MHz. Beam-lead technology was successfully integrated with SOS technology to make a simple device with beam leads. This device and the scribing are discussed. Author

N73-13733# Communications Research Centre, Ottawa (Ontario).
OPTIMUM CRYSTAL ORIENTATION FOR A BARIUM SODIUM NIOBATE TRANSVERSE LIGHT MODULATOR
D. C. Johnson Feb. 1972 17 p refs
(CRC-1229) Avail: NTIS HC $3.00

A theoretical expression was derived for the half-wave voltage required for a transverse modulator constructed from a crystal of barium sodium niobate in an arbitrary orientation. From this expression, the optimum crystal orientation which produces the lowest half-wave voltage was found. Although this work was complicated by the fact that not all the signs of the electro-optic coefficients are known, it is shown that modulators can

be constructed with half-wave voltages significantly lower than was previously available. Author

N73-13734# National Research Council of Canada, Ottawa (Ontario).
CONTRIBUTION TO THE CRYSTAL CHEMISTRY OF THE LAYER SILICATES
F. Liebau 1971 23 p refs Transl. into ENGLISH from Acta Cryst. (Copenhagen), no. B24, 1968 p 690-699
(NRC-TT-1479) Avail: NTIS HC $3.25

The great number of (Si_2O_5) layer silicates is primarily due to the differences in size and charge of the cations. Anhydrous layer silicates show an increasing degree of convolution of layers with decreasing radius/charge ratio of cations, the size of cation sites between layers decreasing at the same time. This explains why 1+ cations form anhydrous layer silicates and 2+ cations of small or medium size and 3+ cations do not. In hydrous layer silicates the (MeO(OH)N) polyhedra are effective cations. The deviation from a plain conformation increases with increasing ratio radius/charge, from $Al_4(Si_4O_{10})(OH)_8$, and the bent serpentines to the ruffled ones of pyrosmalite and apophyllite. Author

N73-13735# Joint Publications Research Service, Arlington, Va.
SUPERCONDUCTING MAGNET SYSTEMS, FIELD WINDINGS AND INDUCTORS
V. V. Sychev, G. G. Borzov, and A. I. Bertinov 30 Nov. 1972 38 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Energ. i Transport (Moscow), no. 4, 1972 p 21-49
(JPRS-57638) Avail: NTIS HC $4.00

Articles are presented on some problems of building superconducting magnet systems, of building high-power turbogenerator with superconducting field windings, and on the selection of basic dimensions of synchronous generator with superconducting inductor. Author

N73-13736*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A STUDY OF BERYLLIUM AND BERYLLIUM-LITHIUM COMPLEXES IN SINGLE CRYSTAL SILICON
Roger K. Crouch, James B. Robertson, and T. E. Gilmer, Jr. Washington Dec. 1972 31 p refs
(NASA-TR-R-395; L-8545) Avail: NTIS HC $3.00 CSCL 20L

When beryllium is thermally diffused into silicon, it gives rise to acceptor levels 191 MeV and 145 meV above the valence band. Quenching and annealing studies indicate that the 145-MeV level is due to a more complex beryllium configuration than the 191-MeV level. When lithium is thermally diffused into a beryllium-doped silicon sample, it produces two acceptor levels at 106 MeV and 81 MeV. Quenching and annealing studies indicate that these levels are due to lithium forming a complex with the defects responsible for the 191-MeV and 145-MeV beryllium levels, respectively. Electrical measurements imply that the lithium impurity ions are physically close to the beryllium impurity atoms. The ground state of the 106-MeV beryllium level is split into two levels, presumably by internal strains. Tentative models are proposed. Author

N73-13737*# Maryland Univ., College Park. Computer Science Center.
THE X-RAY SYSTEM OF CRYSTALLOGRAPHIC PROGRAMS FOR ANY COMPUTER HAVING A PIDGIN FORTRAN COMPILER
J. M. Stewart, (ed.), G. J. Kruger, (ed.), H. L. Ammon, (ed.), C. Dickinson, (ed.), and S. R. Hall, (ed.) Jun. 1972 283 p refs Sponsored in part by ARPA
(Grant NGL-21-002-008)
(NASA-CR-129908; TR-192) Avail: NTIS HC $16.25 CSCL 20L

A manual is presented for the use of a library of crystallographic programs. This library, called the X-ray system, is designed to carry out the calculations required to solve the structure of crystals by diffraction techniques. It has been implemented at the University of Maryland on the Univac 1108. It has, however, been developed and run on a variety of machines under various operating systems. It is considered to be an essentially machine independent library of applications programs. The report includes definition of crystallographic computing terms, program descriptions, with some text to show their application to specific crystal problems, detailed card input descriptions, mass storage file structure and some example run streams. Author

N73-13738# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.
PRELIMINARY STUDY OF A SUPERCONDUCTING DIPOLE IN DIRECT CURRENT
G. Pasotti and M. Spadoni 27 Jan. 1972 17 p refs In ITALIAN
(LNF-72/6) Avail: AEC Depository Libraries

Preliminary design studies were made on the development of a two-sector superconducting dipole with the maximum field of 30 kOe, magnetic length of 35 cm, free diameter of about 10 cm, probable utilization region of 7 cm, and transverse field uniformity of about 1 percent. The analysis suggests the advantage of simpler construction than the ellipse. Another advantage is the easier calculation of the spurious harmonic components and the field distortions. NSA

N73-13739# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Experimentelle Kernphysik.
ASPECTS OF A PULSED SUPERCONDUCTING BENDING MAGNET
G. Ries and K. P. Juengst Sep. 1971 18 p refs
(KFK-1354) Avail: AEC Depository Libraries

Various winding cross sections for generation of uniform fields in pulsed superconducting synchrotron magnets are described. For cooling, the insertion of vertical cooling channels in the winding cross section is proposed through which the coolant flows. It is shown that a dipole configuration with current return paths at the coil ends perpendicular to the magnet axis and longitudinal straight winding sections of equal length generates an integral of Bdl constant over the aperture. These points are taken into account in a proposal for the coil design of a 50-kGauss bending magnet. The subdivision into coil packets and the fabrication of the single coils are described. Author (NSA)

N73-13740# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
PRINCIPLES OF CALCULATION, OPTIMIZATION, AND COST FACTORS OF NORMALLY CONDUCTING CRYOTECHNICAL AND SUPERCONDUCTING MAGNETS FOR EXPERIMENTAL PLASMA PHYSICS
B. Oswald Nov. 1971 112 p refs In GERMAN; ENGLISH summary
(IPP-4/96) Avail: AEC Depository Libraries

A number of calculations and optimizing methods for normal conductive, cryogenic, and superconducting magnets in linear (cylindrical) and toroidal devices are reported. As a basis for the comparison of costs of various magnet systems, relevant cost factors and functions are given. Author (NSA)

N73-13741# Sandia Labs., Albuquerque, N.Mex. Guidance Components and EM Effects Div.
CAPACITANCE ANALYSIS FOR ARBITRARY CYLINDRICAL GEOMETRIES: APPLICATION TO ELECTROMAGNETIC COUPLING INTO SUBSYSTEMS THROUGH CABLES
Leonard D. Licking Jun. 1972 18 p refs Sponsored by AEC
(SC-RR-720299) Avail: NTIS

Electromagnetic energy is often coupled to vulnerable subsystems through cables. The analysis of the electromagnetic response of transmission lines and cables requires a knowledge of the self capacitance of the conductors and the mutual capacitance between conductors. For some simple geometries, like coaxial cables, the solution is straightfoward and well known. However, since cables generally involve complex geometries, a more general solution is then necessary. Such a solution is provided in this report and an example problem is solved. Author

N73-13742# Illinois Univ., Urbana.
STUDY OF LOW TEMPERATURE MICROCREEP IN NIOBIUM SINGLE CRYSTALS Ph.D. Thesis
Melvin Francis Bluem Jun. 1972 135 p refs
(Contract AT(11-1)-1198)
(COO-1198-909) Avail: NTIS

A study of the mechanism or mechanisms controlling thermally activated slip deformation in niobium single crystals was conducted by a creep deformation experiment in the temperature range from 5 K to 300 K. The main emphasis was placed on a determination of the activation parameters. In addition to activation volume measurements, the activation enthalpy was determined at each temperature by temperature cycling. The tests were performed on ultra high vacuum annealed specimens and specimens with a controlled amount of interstitial atoms added after annealing to study the impurity effects. Room temperature prestrain of 1% or less was used to study the effects of dislocation structure on the activation parameters. The resulting data are compared with those in the literature for activation parameters obtained in constant strain rate experiments at much larger strains. NSA

N73-13743# Brookhaven National Lab., Upton, N.Y. Experimental Planning and Support Div.
THERMAL CONDUCTIVITY OF BRAIDED SUPERCONDUCTOR SYSTEMS
B. DeVito and J. E. Jensen 1972 17 p Presented at Cryogenic Eng. Conf., Boulder, Colo., 9-11 Aug. 1972 Sponsored by AEC
(BNL-16615; Conf-720803-1) Avail: NTIS

Heat transfer within a superconducting matrix as in magnet coils is of importance to magnet designers. A series of experiments designed to give engineering values of the thermal conductivity within two heterogeneous braided superconductor systems is described. The systems tested and the experimental procedure are described. The results are presented along with a comparison to a mathematical model. Author (NSA)

N73-13744# Oak Ridge National Lab., Tenn. Thermonuclear Div.
EXPERIMENTS ON STABILITY OF Nb3Sn
K. R. Efferson and H. M. Long Jun. 1972 8 p refs Presented at Appl. Superconductivity Meeting, Annapolis, 1 May 1972 Submitted for publication
(Contract W-7405-eng-26)
(ORNL-TM-3887; Conf-720513-10) Avail: NTIS

A series of magnetization experiments were performed in an attempt to simulate conditions in previously performed cusp coil tests. A comparison of the cusp coils and magnetization tests is presented. Also, the latest use of these results in building a 3-in. clear-bore, 115-kG laboratory magnet from Nb3Sn ribbon is described. NSA

N73-13745# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
ANALYSIS BY SECONDARY IONIC EMISSION IN SEMICONDUCTORS
J. B. Quoirin, B. Blanchard, and N. Hilleret 6 Sep. 1971 9 p refs In FRENCH Presented at 3d Intern. Symp. on the Appl. of Vacuum Tech. in Semiconductor Ind., Electron. Components, and Microelectron., Versailles, France, 13 Sep. 1971
(CEA-CONF-1969; Conf-710932-5) Avail: AEC Depository Libraries

A detailed description is given of a secondary ionic emission method for measuring the electrical properties of semiconductors. The diffusion profile of the semiconductors is given. Transl. by E.H.W.

N73-13746# Florida Univ., Gainesville. Dept. of Electrical Engineering.
A CENTER OF COMPETENCE IN SOLID-STATE MATERIALS AND DEVICES
Fredrik A. Lindholm, Eugene R. Chenatte, Robert W. Gould, Larry L. Hench, and Sheng S. Li 10 Apr. 1972 197 p refs
(Contract F19628-68-C-0058; ARPA Order 1060; AF Proj. 8687)
(AD-748862; AFCRL-72-0336; SR-9) Avail: NTIS CSCL 20/12

The increase in terminal currents and noise observed at high drain bias in MOS field-effect transistors is explained by quantitative models that give predictions in good agreement with experiment. We describe the fabrication and resulting properties of a new type of Schottky barrier photodiode. An explanation is proposed for the fall-off in quantum yield observed in metal-semiconductor photodiodes for excitation wavelengths in the near UV region of the spectrum. New results are given for the electron and hole capture rates associated with the defect centers produced by nickel in germanium. The results of basic optical and electrical measurements are reported for amorphous semiconductor As2Se3Sb2Se3 films fabricated by evaporation. Monochromated Guinier-deWolff and Guinier-Lenne x-ray powder cameras and a scanning microdensitometer are combined into a data system for studying solid state reaction kinetics. The changes in the short range ordered structure of an Ni3Fe alloy are determined for a series of anneals between 0 and 40 hours at 480 C. Author (GRA)

N73-13747# Army Materials and Mechanics Research Center, Watertown, Mass.
SPASTIC: A SYSTEM FOR PROGRAMMING ANGLES, SCALAR, AND TIMER BY INTERNAL COUNTING
C. Richard Desper and Thomas F. Quatieri Jun. 1972 36 p refs
(DA Proj. 1T0-62105-A-329)
(AD-748828; AMMRC-TR-72-17) Avail: NTIS CSCL 20/2

SPASTIC is a modification of the FOCAL interpreter designed to control a simple PDP-8L interface for X-ray diffraction experiments. Control operations are accessed through a set of FOCAL functions which control four stepping motors, an internal data-break scalar, a timer based on a crystal clock interrupt, and the X-ray shutter solenoid. Counting of motor pulses, timer pulses, and scalar pulses are all accomplished within the computer to minimize the interface hardware. The system is used to control an Advanced Metals Research low-angle X-ray diffractometer, using one motor for the 2 theta drive and a second for the attenuator wheel. Programs have been written for zeroing in on the primary beam and for step-scanning through 2 theta, taking data points at various 2 theta intervals. The use of FOCAL permits flexibility in the design of experiments by facilitating the programming and the debugging. Author (GRA)

N73-13748# Brown Univ., Providence, R.I. Div. of Engineering.
PREPARATION AND PROPERTIES OF NEW MAGNETIC TRANSITION METAL CHALCOGENIDES Final Report, 1 Feb. 1969 - 31 Jul. 1972
Aaron Wold 31 Jul. 1972 12 p refs
(Contract DA-31-124-ARO(D)-71-G78; DA Proj. 200-61102-B-32D)
(AD-748864; AROD-6079-20-MC) Avail: NTIS CSCL 20/12

Research with the following goals is briefly summarized: To improve the facility available for the preparation of well-characterized compounds involving the transition metals and the group VB and VIB elements; To continue to develop new methods for the crystal growth of these compounds; and To study the effect of anion substitution, as well as the role of non-stoichiometry on the magnetic and electrical properties of these materials. Author (GRA)

N73-13749# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RADIATION DEFECTS IN SILICON IRRADIATED BY PROTONS, DEUTERONS, AND ALPHA PARTICLES
Yu. Bulgakov, T. I. Kovomenskaya, and M. A. Kumakhov 1 Jun. 1972 12 p refs Transl. into ENGLISH from the monograph "Radiatsionnaya Fizika Nemetallicheskikh Kristallov" Minsk, 1970 p 76-80
(AD-748734; FTD-HT-23-342-72) Avail: NTIS CSCL 20/12

The article considers the spatial distribution of radiation defects in silicon irradiated by protons, deuterons and alpha particles with energies of 6 MeV/nucleon. The silicon crystals of n- and p-type had different initial specific resistances. The beam of particles fell along the normal to the edge of the specimen. After irradiation the specific resistance of the specimen was measured along the path of the particles. The measurements were made by the compensation probe method. Author (GRA)

N73-13750# Yeshiva Univ., New York.
MAXWELL R. MAYBAUM INSTITUTE FOR MATERIAL SCIENCES AND QUANTUM ELECTRONICS Quarterly Report
15 Aug. 1972 40 p refs
(Contracts N00014-68-A-0302-0005; DAAB07-72-C-0297;

F33615-72-C-1544; Grant AF-AFOSR-2153-72)
(AD-748336; QR-1) Avail: NTIS CSCL 20/2

The report discusses research on the following topics: Growing material by the Tri-Arc furnace technique; Preparation and crystal growing of iron monosulfide; Preliminary crystallographic studies of a semiconductor to metallic transition in Ti2O3; Derivative technique applied to the study of zinc selenide diode emission; and Detailed electroreflectance of galium arsenide.
GRA

N73-13751# Vanderbilt Univ., Nashville, Tenn. School of Engineering.
STRUCTURAL EFFECTS ON ELECTRICAL PROPERTIES IN AMORPHOUS SEMICONDUCTORS Semiannual Technical Report, 1 Jan. - 30 Jun. 1972
D. L. Kinser and L. K. Wilson 30 Jul. 1972 248 p refs
(Contract DAHC04-70-C-0046; ARPA Order 1562)
(AD-748661; SATR-4) Avail: NTIS CSCL 20/12

Work has continued on a survey of the structure, electrical and magnetic properties of transition metal oxide-phosphate glasses and glasses in the As2Te3-As2Se3 system which possess electrical or magnetic device potential. Results of magnetic and electrical observations in several transition metal-phosphate glasses have revealed a high degree of magnetic and structural order. The pronounced influence of glass-glass phase separation and compositional segregation has also been noted. Examination of a series of FeO-P2O5 glasses has revealed a glass forming range which extends to 80 mole % FeO. Low temperature susceptibility and Mossbauer spectroscopy results on these glasses are reported herein. Low temperature susceptibility of the manganese, vanadium and iron glasses indicate that these glasses are all amorphous antiferromagnetic systems with a distinctive downward curvature of the reciprocal susceptibility versus temperature plot. Detailed studies of the As2Te3-As2Se3 system has shown switching behavior which can be controlled with compositional variation. The compositional variation of the microstructure is noted in micrographs included in the report.
Author (GRA)

N73-13752# IBM Watson Research Center, Yorktown Heights, N.Y.
MAGNETIC SEMICONDUCTORS: A STUDY OF MAGNETIC, OPTICAL AND TRANSPORT PROPERTIES AND THEIR INTERDEPENDENCE Final Report, 15 Jun. 1970 - 15 Jun. 1972
F. Holtzberg, W. A. Thompson, J. B. Torrance, and S. VonMolnar 15 Jun. 1972 11 p refs
(Contract N00014-70-C-0272)
(AD-747692) Avail: NTIS CSCL 20/12

The report summarizes research in magnetic semiconductors carried out by the authors. A list of oral presentations and publications is included.
Author (GRA)

N73-13753# North American Rockwell Corp., Anaheim, Calif. Electronics Group.
FUNDAMENTAL STUDIES OF SEMICONDUCTOR HETEROEPITAXY Semiannual Report, Jan. - Jun. 1972
Ralph P. Ruth, A. James Hughes, Joseph L. Kenty, Harold M. Manasevit, and Arthur C. Thorsen Jul. 1972 128 p refs
(Contract DAAH01-70-C-1311; ARPA Order 1585)
(AD-748424; C71-86.4/501; SAR-4) Avail: NTIS CSCL 20/12

The objective of this program is to carry out a fundamental study of nucleation and film growth mechanisms in heteroepitaxial semiconductor thin films, and to apply the results to the preparation of improved films and thin-film devices on insulating substrates. Both theoretical and experimental investigations are involved, with emphasis on chemical vapor deposition (CVD) techniques applied to the Si-on-Al2O3, Si-on-MgAl2O4, and GaAs-on-Al2O3 systems. The accomplishments of the fourth six-month period are described in terms of seven program subtasks.
Author (GRA)

N73-13754# Missouri Univ., Rolla.
MAGNETIC STRUCTURE DETERMINATION OF RARE EARTH-COBALT-IRON SYSTEMS, RFe(x)Co(5-x) BY NEUTRON DIFFRACTION Annual Report, 15 Mar. 1971 - 15 Mar. 1972
William J. James and Remy Lemaire Wright-Patterson AFB, Ohio AFML Aug. 1972 74 p refs Prepared in cooperation with Centre Natl. de la Rech. Sci., Grenoble, France
(Contract F33615-71-C-1332; AF Proj. 7367)
(AD-748429; AFML-TR-72-153; AR-1) Avail: NTIS CSCL 20/12

Hexagonal intermetallic compounds close to R2M17 stoichiometry in the Lu-Fe, Th-Ni, Y-Ni, and Er-Co systems have been studied by single crystal X-ray techniques. Additional neutron diffraction studies were made of the Lu-Fe compound. The thermal variation of lattice parameters of rare earth-transition metal intermetallic compounds rich in Fe, Co, or Ni in the temperature range 25-900 K was studied. Lattice parameter measurements have been made on Y(x)La(1-x) Fe(y)Co(5-y) alloys. Neutron diffraction studies of LuFe(9.5) and HOFe3 were made to determine their magnetic structure. The ferromagnetic behavior of LuFe(9.5) up to 100 K has been confirmed.
Author (GRA)

N73-13755# Cornell Univ., Ithaca, N.Y. School of Engineering.
ADVANCED CONCEPTS OF MICROWAVE GENERATION AND CONTROL IN SOLIDS Technical Report, 1 Jan. - 31 Mar. 1972
G. C. Dalman, L. F. Eastman, C. A. Lee, and J. Frey Griffiss AFB, N. Y. RADC Jun. 1972 165 p refs
(Contract F30602-71-C-0110)
(AD-748241; RADC-TR-72-144) Avail: NTIS CSCL 09/1

The report deals with the progress made during the sixth quarterly period of a solid state microwave oscillator and amplifier research and development program. Included are the results of studies of transferred electron and avalanche diodes and solid state materials. Discussed first are LSA diodes and circuits, Gunn effect amplifiers and oscillators, a PCM Gunn oscillator, and GaAs materials studies. Next discussed are IMPATT and TRAPATT diode research results. A discussion on the Relaxing Avalanche Mode and its relation to other avalanche diode modes is also presented. Also reported are studies of Baritt diodes for high frequency CW operation, and for low frequency pulsed operation. The report concludes with a discussion of the progress made on ion implantation, on vacuum epitaxial growth in silicon and on ionization rates in GaAs.
Author (GRA)

N73-13756# Ohio State Univ., Columbus. Dept. of Metallurgical Engineering.
ELECTRICAL CONDUCTION IN DISCONTINUOUS FILMS ON AN INSULATING SUBSTRATE Final Report, 20 Apr. 1969 - 15 Apr. 1972
Joseph E. Dryer Wright-Patterson AFB, Ohio AFML Mar. 1972 115 p refs
(Contract F33615-69-C-1026; AF Proj. 7353)
(AD-748269; AFML-TR-72-68) Avail: NTIS CSCL 20/12

Experimental and theoretical investigation of the electrical properties of thin films during the nucleation stage of film growth was undertaken. It was found that electrostatic forces in the film can significantly influence the film resistance, nucleation rate and island size. Electrode contact effects were also found to have a large effect in measurements taken across narrow films. Experimentally it was found that a number of films investigated exhibited a reversible switching phenomena, wherein they underwent a substantial increase in conductivity when subjected to large voltages. This high conductivity then persisted to lower voltages and subsequently the film could be converted to its original condition. Previous theories of conduction in discontinuous films were considered and modified to include electrode carrier injection and substrate dielectric polarization.
Author (GRA)

N73-13757# Washington State Univ., Pullman. Dept. of Physics.
MATERIAL BEHAVIOR IN HIGH SPEED IMPACT Final Report
George E. Duvall and G. Richard Fowles 15 Jul. 1972 10 p refs
(Contract F44620-67-C-0087; ARPA Order 985)
(AD-748267; AFOSR-72-1282TR) Avail: NTIS CSCL 20/12

A gas gun facility was established for the purpose of studying effects of impact in solids. Research was conducted on the dynamic strength of several materials with the goal of relating macroscopic effects to atomic mechanisms. It was discovered that some crystals (lithium fluoride) that are relatively soft and plastic under

usual conditions can support extremely large stress differences for short periods of time. Further, the observed strength cannot be explained by usual theories applicable to low strain rate behavior. Author (GRA)

N73-13758# Watkins-Johnson Co., Palo Alto, Calif.
ELECTRON BEAM SEMICONDUCTOR DEVICES Final Draft Report, 10 Feb. 1971 - 19 May 1972
James A. Long Sep. 1971 24 p
(Contract DAAB07-71-C-0120)
(AD-748892; W-J-22-4087R1; ECOM-0120-1) Avail: NTIS CSCL 09/5

The object of the program was to (a) evaluate the capability of an electron beam-semiconductor pulse amplifier for switching repeated short pulses of a few amperes with nanosecond risetime and (b) construct semiconductor diodes for use as an RF amplifier in an electron beam device. Author (GRA)

N73-13759# University of Southern Calif., Los Angeles. Electronic Science Lab.
NEW METHODS FOR GROWTH AND CHARACTERIZATION OF GaAs AND MIXED III-V SEMICONDUCTOR CRYSTALS Final Technical Report, 1 Jul. 1971 - 30 Jun. 1972
William R. Wilcox 30 Jun. 1972 137 p refs
(Contract DAHC15-71-G6; ARPA Order 1623)
(AD-748344; USCEE-423) Avail: NTIS CSCL 20/12

The purpose of the program is to develop new and improved methods for the growth and characterization of gallium arsenide (GaAs) and mixed III-V semiconductor crystals. A new Czochralski technique was developed which permits fairly routine growth of dislocation-free GaAs crystals. An apparatus for liquid-encapsulated floating-zone melting of III-V crystals was constructed and is gradually being improved. A new method was developed to lower oxygen concentrations during liquid epitaxial growth of GaAs, so as to permit growth at significantly lower temperatures and analysis of the oxygen content of semiconductors. The influence of bending and short term heating on mobility and carrier concentration of GaAs has been studied. GRA

N73-13760# Naval Postgraduate School, Monterey, Calif.
AN EXAMINATION OF THE COLD TIP THEORY OF WHISKER GROWTH M.S. Thesis
Mark Daniel Hovermale Jun. 1972 110 p refs
(AD-749038) Avail: NTIS CSCL 20/2

A new consideration in the growth mechanism of whiskers is examined. The heat flow due to the shape of the crystal and the thermodynamics of the growth reaction is believed to be an important factor in the unidirectional growth observed in whiskers. A computer program was formulated to model the heat flow as well as a method to calculate the time necessary for the temperature changes to occur. It was found that there is substantial reason to believe the whisker tip is significantly cooler than the sides. This phenomenon is referred to as the cold tip mechanism which provides a preferential growth site for reaction at the tip. Author (GRA)

N73-13761# Massachusetts Inst. of Tech., Cambridge.
BAND STRUCTURE AND ELECTRICAL PROPERTIES OF AMORPHOUS SEMICONDUCTORS Semiannual Technical Report, 1 Jan. - 30 Jun. 1972
David Adler 30 Jun. 1972 12 p refs
(Contract DAHC04-70-C-0048; ARPA Order 1562)
(AD-749379; SATR-4) Avail: NTIS CSCL 20/12

Contents: Electrical conductivity in disordered systems; Crystalline and amorphous silicon telluride; Transport studies of As2Se3-Sb2Se3 glasses; Experimental studies of threshold switching; Optical absorption and photoconductivity measurements on chalcogenide-glass films; Electron-bombardment-induced conductivity in chalcogenide films; Chalcogenide glass-silicon heterojections; Four-probe conductivity measurements on chalcogenide devices; Low-temperature studies of threshold switching; Electrothermal models for threshold switching. GRA

N73-13762# Boeing Co., Seattle, Wash.
THE STRUCTURE OF NON-CRYSTALLINE MATERIALS. CALORIMETRIC, DIFFRACTION AND MICROSCOPIC EXAMINATION OF EVAPORATED AMORPHOUS GERMANIUM
F. W. Lytle, D. E. Sayers, and A. K. Eikum Sep. 1972 22 p refs
(Contract DAHC04-71-C-0010; ARPA Order 1562)
(AD-749363; D180-15130-1) Avail: NTIS CSCL 20/2

Dynamic calorimetric and thermal gravimetric measurements revealed that evaporated, amorphous Ge adsorbed up to 3 weight % H2O when exposed to the atmosphere. Desiccation removed one-half; however, the remainder was removed only by heating to 450C which also recrystallized the material. The heat of crystallization was found as was the entropy of crystallization. Electron microscopic examination revealed about a 100 A void network as found by others with heterogenous crystallization as samples were annealed beginning at about 200C. During the annealing and crystallization, the normally forbidden (222) electron diffraction reflection was frequently observed. Author (GRA)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N73-13763 Michigan Univ., Ann Arbor.
THEORETICAL ANALYSIS OF A ROTATING TWO PHASE DETONATION IN A LIQUID PROPELLANT ROCKET MOTOR Ph.D. Thesis
I-wu Shen 1971 198 p
Avail: Univ. Microfilms Order No. 72-4974

High frequency tangential mode instabilities in liquid rocket motors are sometimes associated with steep-fronted self-sustained pressure waves, resembling detonation waves in certain respects. A given combustion chamber may be stable in the presence of mild disturbances. There are critical disturbances, however, above which high amplitude waves may be developed and sustained as long as propellants supply energy. These highly nonlinear instabilities are classified as shock instabilities. A nonlinear analysis to study shock instabilities, using Chapman-Jouguet two-phase detonation as a reaction model, is carried out. From the results of this analysis one is able to relate the strength of the waves to the design parameters for wave-free running conditions, and hence to provide design directions for preventing shock instabilities. Dissert. Abstr.

N73-13764*# General Dynamics/Convair, San Diego, Calif.
STUDY OF LOW GRAVITY PROPELLANT TRANSFER Final Report, 23 Jun. 1970 - 31 May 1972
Jun. 1972 247 p refs
(Contract NAS8-26236)
(NASA-CR-123947; GDCA-DDB-72-002) Avail: NTIS HC $14.50 CSCL 21I

The results are presented of a program to perform an analytical assessment of potential methods for replenishing the auxiliary propulsion, fuel cell and life support cryogens which may be aboard an orbiting space station. The fluids involved are cryogenic H2, O2, and N2. A complete transfer system was taken to consist of supply storage, transfer, and receiver tank fluid conditioning (pressure and temperature control). In terms of supply storage, the basic systems considered were high pressure (greater than critical), intermediate pressure (less than critical), and modular (transfer of the tanks). Significant findings are included.
Author

N73-13765# National Aerospace Lab., Tokyo (Japan).
STRAIN MEASUREMENT OF SOLID-PROPELLANT MATERIALS WITH BIREFRINGENT COATING
Shinichi Koshide Jan. 1972 16 p refs In JAPANESE; ENGLISH summary
(NAL-TR-261) Avail: NTIS HC $3.00

Birefringent coating method applies to the strain measurement of the viscoelastic materials like the solid propellant grain. Epoxy resin is used for the birefringent coating, and aluminum powder is used for binding agent. As actual examples, two kinds of strain measurement are dealt with, i.e. one is the uniaxial creep test for simple specimen of the solid propellant in constant

temperature, and another is the creep test of a plate which has a circular hole. Comparing the former result with the other method, it is confirmed that the method is available for the strain measurement of such materials. It is advocated that the method can apply for the strain measurement of the problems involving temperature changes. And assuming that the solid propellant is linear viscoelastic, stresses are determined by the strain with the method and the constitutive equation in the theory of linear viscoelasticity. Author

N73-13766# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Lampoldshausen (West Germany). Inst. fuer Chemische Raketenantriebe.
PREDEVELOPMENT STUDIES OF A FLOX/POLYETHYLENE HYBRID PROPULSION SYSTEM [UNTERSUCHUNGEN ZUR VORENTWICKLUNG EINES FLOX/POLYAETHYLEN-HYBRIDTRIEBWERKES]
H. Weiler 1972 26 p refs In GERMAN Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-86) Avail: NTIS HC $3.50

The results of combustion experiments with FLOX/polyethylene hybrid propellants in low thrust engines are used to predict higher thrust behavior. The work was carried out to investigate possible payload increase of the Europa 2 launch vehicle. Regression laws for hybrid propellant combustion are described, and the importance of a correct formula for developing and optimizing propellant geometry is pointed out. The transfer ability of results to higher thrust engines with different combustion chamber geometry is discussed. Materials for conduits, armatures, combustion chambers, and blast pipes, which are compatible with hybrid propellants, are surveyed. Missions for a high energy hybrid propellant module are summarized with regard to the Europa series launch vehicles. Author (ESRO)

N73-13767# Ultrasystems, Inc., Irvine, Calif.
NUMERICAL ANALYSIS OF NONLINEAR LONGITUDINAL COMBUSTION INSTABILITY IN METALIZED PROPELLANT SOLID ROCKET MOTORS. VOLUME 1: ANALYSIS AND RESULTS
Jay N. Levine and F. E. C. Culick Jul. 1972 191 p refs
(Contract F04611-71-C-0060; AF Proj. 5730)
(AD-748415; AFRPL-TR-72-80-Vol-1) Avail: NTIS CSCL 21/9

The present report is part of a two volume set which describes a nonlinear solid rocket motor instability analysis and computer program. The primary objective of the current effort was the development and solution of a nonlinear analytical longitudinal instability model, which would allow all of the various governing phenomena to be accounted for in a coupled manner. The two primary elements of the current instability analysis are a method of characteristics solution of the two phase flow in the combustion chamber of the motor, and a coupled calculation of a transient burning rate. It is based on an extension of the most popular, linear, harmonic combustion response model. The current method allows the calculation of propellant burning response to a pressure disturbance of arbitrary waveform, for all time, including the period immediately following the initiation of the disturbance. The analysis also includes a model for velocity coupled response. The nonlinear effects of velocity coupling on the growth of pressure waves in a combustion chamber can be computed.
Author (GRA)

N73-13768# Ultrasystems, Inc., Irvine, Calif.
NUMERICAL ANALYSIS OF NONLINEAR LONGITUDINAL COMBUSTION INSTABILITY IN METALIZED PROPELLANT SOLID ROCKET MOTORS. VOLUME 2: COMPUTER PROGRAM USER'S MANUAL
Jay N. Levine and F. E. C. Culick Jul. 1972 70 p
(Contract F04611-71-C-0060; AF Proj. 5730)
(AD-748417; AFRPL-TR-72-88-Vol-2) Avail: NTIS CSCL 21/9

The present report is part of a two volume set which describes a nonlinear solid rocket motor instability analysis and computer program. This volume of the set describes the computer program and serves as a user's manual. GRA

N73-13769# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
MEASUREMENT OF SOLID PROPELLANT BURNING RATES DURING RADIO DEPRESSURIZATION Annual Report
Albert T. Clary and Samuel V. Shelton 1 Sep. 1971 123 p refs
(Grant AF-AFOSR-1934-70; AF Proj. 9711)
(AD-748256; AFOSR-72-1686TR; AR-1) Avail: NTIS CSCL 21/9

A microwave continuous measurement technique has been used to measure burning rates of a carboxyl-terminated polybutadiene and ammonium perchlorate composite solid propellant during rapid decompression. A microwave signal oscillating at a known source frequency is passed through the end of a burning propellant strand opposite the burning surface and allowed to reflect off the burning surface. By continuously comparing the phase angle of this reflected signal with the phase angle of another signal oscillating at the orginal source frequency, a relative phase angle of another signal oscillating at the original source frequency, a relative phase angle between the two signals is obtained. The rate of change of this relative phase angle with time is proportional to the propellant's burning rate. Possible errors were investigated and conclusions reached concerning them. Author (GRA)

N73-13770# Naval Postgraduate School, Monterey, Calif.
COOL-DOWN PROBLEM OF A SOLID PROPELLANT ROCKET MOTOR INCORPORATING DEWETTING M.S. Thesis
Donald Wellmann Jun. 1972 50 p refs
(AD-749036) Avail: NTIS CSCL 21/9

The thesis undertook a macroscopic, theoretical analysis of a long, circular, solid propellant rocket motor undergoing thermal loading. It was shown that classical plasticity's vonMises yield condition adequately described dewetting of solid propellant which was modeled to have linear strain hardening characteristics. The mechanical properties of the propellant permitted a closed-form solution for the stresses and the strains resulting from cooling the motor from 160F to -60F. Author (GRA)

N73-13771# Utah Univ., Salt Lake City. Coll. of Engineering.
ON THE GENERAL THEORY OF STEKLOV: AGING MATERIALS
J. Edmund Fitzgerald Aug. 1972 35 p refs
(Contract N00014-67-A-0325-0001; Grant AFOSR-2332-72; AF Proj. 7921)
(AD-748943; UTEC-CE-72-145; AF-AFOSR-72-1782TR) Avail: NTIS CSCL 21/9

A broad class of materials possessing both instantaneous nonlinear elasticity and dissipation in addition to fading memory with aging effects is described. The measure of the generalized input function, which is a multiplet in terms of the deformation gradient, the temperature, the gradient of the temperature, as well as various chemical affinities, is given a semi-norm over a Banach Space. The semi-norm includes a summand which is a modification of the Steklov Average to P - integrable Lebesgue functions. It is assumed that the generalized response is a nonlinear function of the present input and a material property-history kernel determined by a Steklov-Lebesgue norm. Examples applied to solid propellant are given. Author (GRA)

N73-13772# Naval Research Lab., Washington, D.C.
REDUCTION OF ELECTROSTATIC CHARGE IN JET FUELS DURING REFUELER LOADING Final Report
Joseph T. Leonard and W. Carhart 20 Jun. 1972 21 p refs
(AD-748995; NRL-7415) Avail: NTIS CSCL 21/4

A 30-second relaxation chamber and a static charge reducer (SCR) were evaluated for their effectiveness in dissipating the electrostatic charge during refueler loading of JP-5 fuel at flow rates of 300 to 540 gpm. The electrical conductivity of the JP-5 fuel was in the range of 0.1 to 10 C.U. at 78F(1 C.U. = 1 X 10 to the minus 14 power mhos/cm). A JP-4 fuel with a conductivity of 7.8 C.U. was also tested to a limited extent. The experimental setup consisted of a 600-gpm filter/separator equipped with fuel monitors, a 30-second relaxation chamber, and a static charge reducer located in parallel downstream of the filter/separator, a 13-ft refueling hose (2-1/2in. or 3-in. diameter), and either a 7050- or a 8200-gallon refueler. The charge density in the fuel was measured immediately downstream of the filter/separator, at the outlet of the relaxation device,

and at the dry break or loading connection to the refueler.
Author (GRA)

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magneto-hydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N73-13773* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROCKET THRUST THROTTLING SYSTEM Patent
John W. Gregory, inventor (to NASA) Issued 14 Nov. 1972 5 p Filed 18 Jan. 1971 Supersedes N71-31103 (09-18, p 3001)
(NASA-Case-LEW-10374-1; US-Patent-3,702,536; US-Patent-Appl-SN-107380; US-Patent-Class-60-211; US-Patent-Class-60-240; US-Patent-Class-60-243; US-Patent-Class-137-81.5) Avail: US Patent Office CSCL 21H

A system for throttling rocket thrust is described. A small vortex fluid amplifier is located at the entrance to the oxidizer tube of a coaxial injector. The vortex fluid amplifier differentially controls the oxidizer flow by means of a variable vortex flow field to throttle the thrust of the rocket engine.
Official Gazette of the U.S. Patent Office

N73-13774# National Aerospace Lab., Tokyo (Japan).
AN INVESTIGATION OF SECONDARY INJECTION THRUST VECTOR CONTROL
Tatsuo Yamanaka May 1972 51 p refs
(NAL-TR-286T; TR-286T) Avail: NTIS HC $4.75

Secondary injection thrust vector control (SITVC) of rockets was studied. An experimental and analytical study on disturbances produced by secondary injection and on an estimation of control forces produced by SITVC is presented. The SITVC is done by gas injection or by liquid injection. The control force producing mechanism of gas injection TVC is a little different from that of liquid injection TVC. Most of the study is devoted to investigating the disturbances produced by under-expanding gas injection TVC and to presenting an analytical method for estimating control forces of gas injection. Disturbances such as under-expanding gas injection flow, complicated flowfield ahead of injection flow, and leading shock wave in a conical supersonic flowfield are investigated by using two-dimensional cold and dry air flow and by using conical lens method. An analytical model to predict the disturbances induced by secondary gas injection is presented. The comparison of the analysis with the induced disturbed flow is shown in good correlation. Based on the analysis, an estimation of produced control forces by gas injection is tried. The measured control forces produced by secondary gas injection thrust vector control tests, conducted on solid propellant rockets, are compared with the estimated control forces. Author

N73-13775# Comision Nacional de Investigaciones Espaciales, Buenos Aires (Argentina).
FEASIBILITY STUDY OF PROPULSION SYSTEMS WITH VELOCITIES ON THE ORDER OF 8 km/SECOND AND PAYLOADS OF 50 KILOGRAMS, AND CONTROL AND GUIDANCE SYSTEMS FOR ROCKETS, PART 1 [ESTUDIO DE FACTIBILIDAD SOBRE SISTEMA DE PROPULSION PARA ALCANZAR VELOCIDADES DEL ORDEN DE 8 km/seg CON CARGAS UTILES DE 50 kgs Y SOBRE SISTEMAS DE CONTROL Y GUIADO PARA COHETES]
C. A. Cavallini and C. DelSoldato [1972] 22 p In SPANISH
(Rept-13) Avail: NTIS HC $3.25

The parameters of a rocket capable of velocities of 8 km/sec are determined using simplified equations of motion. Based on the analysis of the variation of weight at launch as a function of the number of stages, four stages are determined to be the optimum number. The relation of the mass of the shell to the optimum propulsion for each stage is computed.
Transl. by F.O.S.

N73-13776# Comision Nacional de Investigaciones Espaciales, Buenos Aires (Argentina).
FEASIBILITY STUDY OF PROPULSION SYSTEMS WITH VELOCITIES ON THE ORDER OF 8 km/SECOND AND PAYLOADS OF 50 KILOGRAMS, AND CONTROL AND GUIDANCE SYSTEMS FOR ROCKETS, PART 2 [ESTUDIO DE FACTIBILIDAD SOBRE SISTEMA DE PROPULSION PARA ALCANZAR VELOCIDADES DEL ORDEN DE 8 km/seg CON CARGAS UTILES DE 50 kgs Y SOBRE SISTEMAS DE CONTROL Y GUIADO PARA COHETES, TOMO 2]
C. A. Cavallini and C. DelSoldato [1972] 34 p refs In SPANISH
(Rept-13-Pt-2) Avail: NTIS HC $3.75

Rocket control during acceleration, after launch to the first stage was studied. Systems in use were analyzed, and auxiliary propulsion was chosen for the investigation. It is concluded that the selected system requires the use of a gyroscope, free in three geometries, with primary sensory elements, and four activating servomotors for four auxiliary rocket engines.
Transl. by F.O.S.

N73-13777*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TESTS OF A MIXED COMPRESSION AXISYMMETRIC INLET WITH LARGE TRANSONIC MASS FLOW AT MACH NUMBERS 0.6 TO 2.65
Donald B. Smeltzer and Norman E. Sorensen Washington Dec. 1972 189 p refs
(NASA-TN-D-6971; A-4231) Avail: NTIS HC $3.00 CSCL 21E

A 38.8-cm (15.28-in.) capture diameter model of a mixed-compression axisymmetric inlet system with a translating cowl was designed and tested. The internal contours, designed for Mach number 2.65, provided a throat area of 59 percent of the capture area when the cowl was retracted for transonic operation. Other model features included a boundary-layer removal system, vortex generators, an engine airflow bypass system, cowl support struts, and rotating rakes at the engine face. All tunnel testing was conducted at a tunnel total pressure of about 1 atm (a unit Reynolds number of about 8.53 million/m at Mach number 2.65) at angles of attack from 0 deg to 4 deg. Results for the following were obtained: total-pressure recovery and distortion at the engine face as a function of bleed mass-flow ratio, the effect of bleed and vortex generator configurations on pressure recovery and distortion, inlet tolerance to unstart due to changes in angle of attack or Mach number, surface pressure distributions, boundary-layer profiles, and transonic additive drag. At Mach number 2.65 and with the best bleed configurations, maximum total pressure recovery at the engine face ranged from 91 to 94.5 percent with bleed mass-flow ratios from 4 to 9 percent, respectively, and total-pressure distortion was less than 10 percent. At off-design supersonic Mach numbers above 1.70, maximum total-pressure recoveries and corresponding bleed mass flows were about the same as at Mach number 2.65, with about 10 to 15 percent distortion. In the transonic Mach number range, total pressure recovery was high (above 96 percent) and distortion was low (less than 15 percent) only when the inlet mass-flow ratio was reduced 0.02 to 0.06 from the maximum theoretical value (0.590 at Mach number 1.0). Author

N73-13778*# Fairchild Industries, Inc., Farmingdale, N.Y. Republic Div.
PULSED PLASMA SOLID PROPELLANT MICROTHRUSTER FOR THE SYNCHRONOUS METEOROLOGICAL SATELLITE. TASK 3: MODEL SPECIFICATIONS REPORT
W. J. Guman Jun. 1972 22 p refs
(Contract NAS5-11494)
(NASA-CR-130126; FRD-4087) Avail: NTIS HC $3.25 CSCL 21H

The specifications include applicable documents, requirements, and quality assurance provisions. The specifications also include results of earlier tasks of analysis and preliminary design.
Author

N73-13779*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
SINGLE-STAGE EXPERIMENTAL EVALUATION OF TANDEM-AIRFOIL ROTOR AND STATOR BLADING FOR

COMPRESSORS. PART 5: ANALYSIS AND DESIGN OF STAGES D AND E
J. A. Brent, J. G. Cheatham, and D. R. Clemmons 15 Dec. 1972 157 p refs
(Contract NAS3-11158)
(NASA-CR-121008; FR-5212) Avail: NTIS HC $10.00 CSCL 21E

A conventional and a tandem bladed stage were designed for a comparative experimental evaluation in a 0.8 hub/tip ratio single-stage compressor. Based on a preliminary design study, a radially constant work input distribution was selected for the rotor designs. Velocity diagrams and blade leading and trailing edge angles selected for the conventional rotor and stator were used in the design of the tandem blading. The effects of axial velocity ratio and secondary flow on turning were included in the selection of blade leading and trailing edge angles. Design values of rotor tip velocity and stage pressure ratio were 757 ft/sec and 1.26, respectively. Author

N73-13780*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRAJECTORY CORRECTION PROPULSION FOR TOPS
Hartwell R. Long and Roy A. Bjorklund 15 Nov. 1972 137 p refs
(Contract NAS7-100)
(NASA-CR-129796; JPL-TR-32-1571) Avail: NTIS HC $9.00 CSCL 21H

A blowdown-pressurized hydrazine propulsion system was selected to provide trajectory correction impulse for outer planet flyby spacecraft as the result of cost/mass/reliability tradeoff analyses. Present hydrazine component and system technology and component designs were evaluated for application to the Thermoelectric Outer Planet Spacecraft (TOPS); while general hydrazine technology was adequate, component design changes were deemed necessary for TOPS-type missions. A prototype hydrazine propulsion system was fabricated and fired nine times for a total of 1600 s to demonstrate the operation and performance of the TOPS propulsion configuration. A flight-weight trajectory correction propulsion subsystem (TCPS) was designed for the TOPS based on actual and estimated advanced components. Author

N73-13781*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ATTITUDE PROPULSION TECHNOLOGY FOR TOPS
Philip I. Moynihan 1 Nov. 1972 81 p refs
(Contract NAS7-100)
(NASA-CR-129795; JPL-TR-32-1560) Avail: NTIS HC $6.25 CSCL 21H

The thermoelectric outer planet spacecraft (TOPS) attitude propulsion subsystem (APS) effort is discussed. It includes the tradeoff rationale that went into the selection of an anhydrous hydrazine baseline system, followed by a discussion of the 0.22 N thruster and its integration into a portable, self-contained propulsion module that was designed, developed, and man rated to support the TOPS single-axis attitude control tests. The results of a cold-start feasibility demonstration with a modified thruster are presented. A description of three types of 0.44 thrusters that were procured for in-house evaluation is included along with the results of the test program. This is followed by a description of the APS feed system components, their evaluations, and a discussion of an evaluation of elastomeric material for valve seat seals. A list of new technology items which will be of value for application to future systems of this type is included. Author

N73-13782*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
EXPERIMENTAL INVESTIGATION OF A THROTTLABLE 15 CM HOLLOW CATHODE ION THRUSTER Annual Report, 1 Dec. 1971 - 1 Dec. 1972
Paul J. Wilbur Dec. 1972 73 p refs
(Grant NGR-06-002-112)
(NASA-CR-121038) Avail: NTIS HC $5.75 CSCL 21C

The use of dished high perveance grids on a 15 cm modified SERT 2 thruster is shown to facilitate throttled operation over a beam current range from 60 to 600 mA. Effects of increasing the radial component of the magnetic field in the main discharge chamber and decreasing the dimensions of the cathode discharge region are examined and found to degrade performance to the extent that primary electrons are forced in toward the center-line of the thruster. Studies of the baffle aperture region of two thrusters indicate that the electric potential gradient vector is perpendicular to the local magnetic field lines when the thruster is operating properly. The correlation between the shape of the ion beam current density and that of the ion density at the screen grid within the thruster is shown to be 94%. Additional experimental studies on maximum propellant utilization, plasma ion production cost, neutral density in the cathode discharge region, double ion production in hollow cathode thrusters and thermal flow meter performance are discussed. Author

N73-13783*# Bell Aerospace Co., Buffalo, N.Y.
HIGH PRESSURE REVERSE FLOW APS ENGINE
J. M. Sennett Nov. 1972 416 p refs
(Contract NAS3-14353)
(NASA-CR-120881; BELL-8636-950004) Avail: NTIS HC $23.00 CSCL 21H

A design and test demonstration effort was undertaken to evaluate the concept of the reverse flow engine for the APS engine application. The 1500 lb (6672 N) thrust engine was designed to operate on gaseous hydrogen and gaseous oxygen propellants at a mixture ratio of 4 and to achieve the objective performance of 435 sec (4266 Nsec/kg) specific impulse. Superimposed durability requirements called for a million-cycle capability with 50 hours duration. The program was undertaken as a series of tasks including the initial preliminary design, design of critical test components and finally, the design and demonstration of an altitude engine which could be used interchangeably to examine operating parameters as well as to demonstrate the capability of the concept. The program results are reported with data to indicate that all of the program objectives were met or exceeded within the course of testing on the program. The analysis effort undertaken is also reported in detail and supplemented with test data in some cases where prior definitions could not be made. The results are contained of these analyses as well as the test results conducted throughout the course of the program. Finally, the test data and analytical results were combined to allow recommendations for a flight weight design. This preliminary design effort is also detailed. Author

N73-13784*# Rocketdyne, Canoga Park, Calif.
SPACE SHUTTLE ORBIT MANEUVERING ENGINE REUSABLE THRUST CHAMBER Final Data Dump
1972 229 p refs
(Contract NAS9-12802)
(NASA-CR-128675; ASR72-238) Avail: NTIS HC $13.50 CSCL 21H

A data dump is presented containing space shuttle orbiter maneuvering engine performance, weight, envelope, and interface pressure requirements for candidate propellant combinations (NTO/MMH, NTO50-50, LOX/MMH, LOX/50-50, LOX/N2H4, LOX/C3H8, and LOX/RP-1) and cooling concepts (regenerative and dump/film). These data are presented parametrically for the thrust, chamber pressure, nozzle expansion ratio, and engine mixture ratio ranges of interest. Also included is information describing sensitivity to system changes; reliability, maintainability and safety; development programs and associated critical technology areas; engine cost comparisons during development and operation; and ecological effects. Author

N73-13785# Technische Hochschule, Aachen (West Germany). Inst. fuer Strahlantriebe und Turboarbeitsmaschinen.
AIR PRECOOLING BEFORE COMPRESSION EFFECT ON THE AIR BREATHING ENGINES OF A SPACE-CRAFT LAUNCH VEHICLE [DER EINFLUSS DER LUFTVORKUEHLUNG VOR DER VERDICHTUNG BEI LUFTATMENDEN ANTRIEBEN EINES RAUMFAHRZEUGTRAEGERS]
H. Kuenkler 1972 34 p refs In GERMAN Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-60) Avail: NTIS HC $3.75

The effect of air precooling before compression on the propulsive efficiency of liquid hydrogen turbojet engines with afterburning was investigated for space shuttle applications. Precooling was reached by heat exchange with the liquid hydrogen fuel flow. The efficiency of this type of engine was determined for the accelerated flight of an aerodynamic space shuttle with regard to the limiting Mach number, the thrust

behavior, the thrust/engine weight ratio and the specific fuel consumption. Results were compared to performance characteristics of competitive engine concepts. The main advantage of air precooling was the essential enlargement of the Mach number range to over 6, with simultaneous improvement of the thrust/weight ratio. Author (ESRO)

N73-13786# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A SINGLE CRYSTAL SERVES AS TURBINE BLADE
D. Petrov and A. Tumanov Jun. 1972 12 p refs Transl. into ENGLISH from Nauka i Zhizn (USSR), no. 1, 1971 p 131-133 (AF Proj. 668A)
(AD-748519; FTD-MT-24-2025-71) Avail: NTIS CSCL 21/5

A technique of growing single grains shaped as turbine blades has been developed at the All Union Scientific Research Institute of Aviation Materials (VIAM). Both solid or hollow blades can be fabricated in this way. The VIAM technique makes possible a complete control of the nucleation and its crystallographic orientation. It just happened that all directions from (001) to (111) are optimum for the strength of turbine blades. Test of single grain specimens made of a nickel base alloy have proved the advantages of the new material. The time to fracture of single grain specimens at 1050 C stresses to 14 kg per square mm was 100 hours against 16 hours for polycrystalline specimens. Author (GRA)

N73-13787# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AUTOMATIC CONTROL OF A FIXED GEOMETRY RAMJET
T. Drozo 22 May 1972 26 p refs Transl. into ENGLISH from Prace Inst. Lotnictwa (Warsaw), no. 24, 1965 p 17-26
(AD-748708; FTD-HC-23-1562-71) Avail: NTIS CSCL 21/5

The operation of a ramjet engine with a fixed nozzle and diffusor geometry is analyzed. It is assumed that the ramjet is the power plant of an experimental aircraft for testing engines with an automatic control. The mechanical control system developed by the author for the ramjet engine for flights at maximum thrust from the initial speed to a pre-set Mach number which is sustained automatically under varying flight conditions is described. Author (GRA)

N73-13788# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE STRENGTH OF THE ROOT CONNECTION OF THE TURBINE BLADES DURING THE PROLONGED STRESS
V. P. Dubinin 31 Jul. 1972 14 p Transl. into ENGLISH from Termoproch. Mater. Konstr. Elem. Sb. (Kiev), no. 5, 1969 p 234-240
(AD-749589; FTD-MT-24-1904-71) Avail: NTIS CSCL 21/5

The report discusses a technique for testing the stress-rupture strength of fir-tree type root joints of turbine blades at elevated temperatures under persistent loads. The results are given for tests at 750 and 830 deg C on experimental joints under loads applied for a period of 500 hr. Disk teeth shearing in the joint is found to be the most frequent cause of breakdown under these conditions. Recommendations are made as to how this type of breakdown could be minimized. GRA

N73-13789# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ANALYSIS OF THE EFFECTIVENESS OF DIFFERENT METHODS OF THE ADJUSTMENT OF PARAMETERS OF A TWIN-SHAFT TURBOJET ENGINE
V. P. Alatortsev, A. M. Akhmedzyanov, and A. S. Tikhonov 4 Aug. 1972 11 p refs Transl. into ENGLISH from Aviat. Inst., UFA. Tr. (USSR), no. 10, 1968 p 48-50
(AD-749058; FTD-MT-24-226-72) Avail: NTIS CSCL 21/5

Analysis of the comparative quality of plotting the parameters of a two shaft turbojet engine by varying the rpm in the low pressure cascade during plotting, or the passage cross section of the jet nozzle, or the areas of the nozzle system passage cross sections in the first and second cascades of the turbine. These plotting techniques are applied in correcting the thrust, specific fuel consumption, gas temperature and compressor steady performance margin of a turbojet engine of this type.
Author (GRA)

N73-13293 Joint Publications Research Service, Arlington, Va.
PERFORMANCE OF A REACTION ENGINE WITH AN EJECTOR SHROUD
G. V. Logvinovich *In its* Hydraulic Jet Flow of an Ideal Liquid and Gas-Liquid Mixtures 20 Oct. 1972 p 1-10 (For availability see N73-13292 04-12)

N73-13295 Joint Publications Research Service, Arlington, Va.
ON THE THEORY OF GAS-HYDRAULIC PROPULSION ENGINES
I. M. Chernyy, N. A. Prikhodko, and Yu. G. Mokeyev *In its* Hydraulic Jet Flow of an Ideal Liquid and Gas-Liquid mixtures 20 Oct. 1972 p 19-32 refs (For availability see N73-13292 04-12)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N73-13790 Colorado Univ., Boulder.
A THEORETICAL STUDY OF FORMATION OF PROMINENCES Ph.D. Thesis
Ernest Gotthold Hildner, III 1971 209 p
Avail: Univ. Microfilms Order No. 72-3662

Numerical computations are presented for the formation of quiescent solar prominences by condensation from the solar corona. The governing equations for one and two dimensional geometries are integrated to obtain solutions which describe the condensation of model coronal material to a cooler, denser state. A fluid approach to the coronal material is taken throughout, except for cooling due to electromagnetic radiation. To all computations, the coronal fluid is assumed to be completely ionized hydrogen, optically thin at all wavelengths, with infinite electrical and zero thermal conductivity. The fluid is assumed to be initially in hydrostatic equilibrium and in thermal balance (heating equal to cooling). That is, the energy function (heating due to mechanical processes minus cooling due to electromagnetic radiation) is zero. If, in the initial state of thermal balance, the isobaric derivative of the energy function with respect to temperature is positive, then a density perturbation of the initial state can result in a condensation. Dissert. Abstr.

N73-13791 New York Univ., N.Y.
FAST NEUTRONS IN THE ATMOSPHERE DURING PERIODS OF SOLAR ACTIVITY Ph.D. Thesis
Edward S. Light 1971 226 p
Avail: Univ. Microfilms Order No. 72-3094

In 1968 and 1969, during the enhanced solar activity around the time of solar maximum, a series of atmospheric measurements of the fast neutron flux was conducted at polar latitudes. Data were obtained during particle events and Forbush-type decreases in June, October, and November 1968, and February through April 1969, as well as in undisturbed periods. The quiet-time data in this series of airplane measurements were consistent with data from balloon flights in the same period. As expected, neutron fluxes at the transition maximum were more sensitive to changes in the primary cosmic ray spectrum, typically by a factor of about three, than were the sea-level neutron monitors. A Monte Carlo simulation of the internuclear cascade in the atmosphere was performed to compare with experimental results as well as to provide the low energy neutron distribution, neutron leakage flux, and radiocarbon (C14) production. The effects of different incoming cosmic ray spectra on the atmospheric neutrons are also displayed. Dissert. Abstr.

N73-13792*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STELLAR CHROMOSPHERES
S. D. Jordan, ed. and E. H. Avrett, ed. Washington 1973 318 p refs Proc. of the Intern. Astron. Union Colloq., Greenbelt, Md., 21-24 Feb. 1972
(NASA-SP-317; LC-70-604567) Avail: NTIS; SOD $2.00 CSCL 03B

The stellar chromosphere is viewed as an important part of the transition region between stellar interior and interstellar medium. Astrophysical theoretical and observational studies consider the different origins of emission lines in stellar spectra and the effects of inhomogeneities, stellar mass, and stellar age on chromospheric composition. For individual titles, see N73-13793 through N73-13800.

N73-13793* Hawaii Univ., Honolulu. Inst. for Astronomy.
TEMPERATURE DISTRIBUTION IN A STELLAR ATMOSPHERE DIAGNOSTIC BASIS
John T. Jefferies and Nancy D. Morrison *In* NASA. Goddard Space Flight Center Stellar Chromospheres 1973 p 3-25 refs (For availability see N73-13792 04-29)
(Grant NSF GP-31750X)
CSCL 03B

A stellar chromosphere is considered a region where the temperature increases outward and where the temperature structure of the gas controls the shape of the spectral lines. It is shown that lines which have collision-dominated source sink terms, like the Ca(+) and Mg(+) H and K lines, can be used to obtain the distribution of temperature with height from observed line profiles. Intrinsic emission lines and geometrical emission lines are found in spectral regions where the continuum is depressed. In visual regions, where the continuum is not depressed, emission core in absorption lines are attributed to reflections of intrinsic emission lines. G.G.

N73-13794* Smithsonian Astrophysical Observatory, Cambridge, Mass.
STELLAR CHROMOSPHERIC MODELS
Eugene H. Avrett *In* NASA. Goddard Space Flight Center Stellar Chromospheres 1973 p 27-76 refs (For availability see N73-13792 04-29)
CSCL 03B

Described are two basic types of theoretical models - radiative equilibrium and empirical - that are used to represent stellar chromospheres. The construction of radiative-equilibrium model atmospheres that show an outward temperature increase in the surface layers is reported. Also discussed is chromospheric cooling due to spectral lines. Solar empirical models describe the empirical determination of solar-type chromospheric models that, in order to match observations, imply a temperature rise substantially greater than that predicted by radiative equilibrium. Such a temperature rise must be largely due to mechanical heating. An attempt is made to apply a scaled solar chromospheric model to a star with a different surface gravity. The results suggest that the chromospheric optical thickness is sensitive to gravity and that the width of chromospheric line emission increases with stellar luminosity. Author

N73-13795* Institut d'Astrophysique, Paris (France).
EVIDENCE FOR STELLAR CHROMOSPHERES PRESENTED BY GROUND BASED SPECTRA OF THE SUN AND STARS
Francoise Praderie *In* NASA. Goddard Space Flight Center Stellar Chromospheres 1973 p 79-97 refs (For availability see N73-13792 04-29)
CSCL 03B

Direct observational evidence of stellar chromospheres is provided by H and K lines and their relationships to mass flux, mechanical dissipation and magnetic fields. Interpretation of half widths of these lines and of the H alpha lines provides indirect indications of potential chromospheric heating in the presence of velocity fields. G.G.

N73-13796* Wisconsin Univ., Madison. Space Astronomy Lab.
EVIDENCE FOR STELLAR CHROMOSPHERES PRESENTED BY ULTRAVIOLET OBSERVATIONS OF THE SUN AND STARS
Lowell Doherty *In* NASA. Goddard Space Flight Center Stellar Chromospheres 1973 p 99-177 refs (For availability see N73-13792 04-29)
(Contract NAS5-1348)
CSCL 03B

Observations of emission lines in stellar sources in the ultraviolet region of the spectrum show P Cygni-like evidence of mass outflow as well as many ultraviolet emission lines which cannot be interpreted wholly in terms of geometric effects. These are considered powerful chromospheric indicators. G.G.

N73-13797* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MECHANICAL HEATING IN STELLAR CHROMOSPHERES USING THE SUN AS A TEST CASE
Stuart D. Jordan *In its* Stellar Chromospheres 1973 p 181-205 refs (For availability see N73-13792 04-29)
CSCL 03B

The shock dissipation hypothesis for solar atmospheric heating is extended to stellar chromospheres of late type stars which have significant convective envelopes. Principle wave modes are studied for their generation, propagation, and heating properties in the presence of a magnetic field, and various approximations on when a sound wave becomes strong enough to produce heating in the atmosphere are presented. G.G.

N73-13798* Nice Observatory (France).
THEORETICAL UNDERSTANDING OF CHROMOSPHERIC INHOMOGENEITIES
Philippe Delache *In* NASA. Goddard Space Flight Center Stellar Chromospheres 1973 p 207-262 refs (For availability see N73-13792 04-29)
CSCL 03B

Detailed theoretical studies of chromospheric inhomogeneities consider dynamics as well as radiative transfer of mass flow as a consequence of energy deposition. It is shown that pressure is exerted by the heating waves, especially in inhomogeneous structures, where they can be defracted. A dynamical model is formulated that depicts the inhomogeneous structure of the chromosphere-corona transition region through mass flow regimes. G.G.

N73-13799* Gottingen Univ. (West Germany).
CHROMOSPHERIC ACTIVITY AND STELLAR EVOLUTION
Rudolf Kippenhahn *In* NASA. Goddard Space Flight Center Stellar Chromospheres 1973 p 265-304 refs (For availability see N73-13792 04-29)
CSCL 03B

A study of stellar chromospheres based on the internal structure of particular stars is presented. Used are complex flow diagrams of the linkage paths between mass loss, angular momentum loss, magnetic field from the turbulent dynamo and its relations to differential rotations and the convection zone, and stellar evolution. G.G.

N73-13800* Hale Observatories, Pasadena, Calif.
SUMMARY OF THE STELLAR CHROMOSPHERES CONFERENCE
O. C. Wilson *In* NASA. Goddard Space Flight Center Stellar Chromospheres 1973 p 305-318 (For availability see N73-13792 04-29)
CSCL 03B

Studies on solar-type stellar chromospheres include diagnostic techniques, observations on different kinds of apparently existing chromospheres, enhancement dynamics of chromospheric activity, and interpretation of stellar spectroscopy with theoretical explanations for chromospheric lines. G.G.

N73-13801# Lockheed Missiles and Space Co., Palo Alto, Calif.
LIGHT SCATTERING BY THE MEDIUM PRODUCED BY A SPACECRAFT
N. M. Dunaev, A. I. Akishin, and V. V. Konstantinova 1972 10 p refs Transl. into ENGLISH from Kosmich. Issled., Akad. Nauk SSSR (Moscow), v. 10, no. 4, 1972 p 580-588
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. CSCL 03B

The glow originating from molecular light scattering, nitrogen fluorescence under the effect of solar wind electrons, and protons in the visible spectrum band is calculated theoretically for a nitrogen gas jet from the pneumatic microengine of a space vehicle. A system of jet engines operating with compressed gas was used for space vehicle orientation and stabilization.
Author

N73-13802*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SHORT-TERM TEMPORAL STUDIES OF THE X RAY EMISSION FROM CAS A, TYCHO AND SCO X-1
Stephen S. Holt, Elihu Boldt, Axel F. Brisken, and Peter J. Serlemitsos Nov. 1972 16 p refs Submitted for publication
(NASA-TM-X-66127; X-661-72-410) Avail: NTIS HC $3.00 CSCL 03B

No evidence for stable 2-10 keV periodic emission from Cas A or Tycho in the period range 1 msec to 10 sec is found. Upper limits to the pulsed fraction are presented as a function of the assumed light curve, with absolute 99% confidence upper limits of 0.089 and 0.195 for Cas A and Tycho, respectively. Previously reported transient 1-10 Hz oscillations from Sco X-1 are not observed. Author

N73-13803*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC GAMMA-RAYS FROM PION DECAY
F. W. Stecker Dec. 1972 6 p refs Submitted for publication
(NASA-TM-X-66120; X-641-72-462) Avail: NTIS HC $3.00 CSCL 03C

The production of gamma rays from the decay of neutral pions produced in interstellar cosmic ray interactions was studied, limited to the total gamma ray intensity. Using the upper-limit gamma ray production, an upper-limit is obtained consistent with that obtained by Kraushaar. It is shown that whatever the shape of the gamma ray spectrum, the normalization has to be consistent with data of the total cross sections. F.O.S.

N73-13804# Atomic Energy of Canada Ltd., Chalk River (Ontario).
COSMIC RAY NM-64 NEUTRON MONITOR DATA FROM KULA, HAWAII AND MONTHLY GRAPHS, JANUARY - DECEMBER 1971
J. F. Steljes and A. Kowalski Apr. 1972 50 p
(AECL-4161) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $1.50

Uncorrected and barometer-corrected hourly data from a 3-NM-64 mobile latitude survey neutron monitor stationed at Kula, Maui, Hawaii, are given in tabular form for the period from January 1971 to December 1971. Correction factors for the drift of the barometer were determined. Graphs of the corrected data are given. Author (NSA)

N73-13805# Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
COSMIC RAY MT-64 MOON MONITOR DATA: 5: FROM SOLAR ROTATION 1853 TO ROTATION 1866 (4 JANUARY 1969 - 16 JANUARY 1970)
J. F. Steljes Jan. 1972 113 p refs
(AECL-4077) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $2.00

Hourly rates corrected for atmospheric temperature and pressure from four cosmic-ray stations in Canada which have muon monitors and from a survey monitor stationed at Kula, Hawaii, are given. The Dorman-Maeda temperature correction factors for each station calculated at 12 hour intervals from the radiosonde data are also listed. Barometric pressures are available from neutron monitor data reports. Graphs of the relative hourly rates at each station are given. Author (NSA)

N73-13806# Sandia Labs., Albuquerque, N.Mex. Radiation Projects Div.
PREDICTION OF THE EFFECTS OF RADIATION ON THE SATURATION VOLTAGE OF POWER TRANSISTORS
B. D. Shafer and L. K. Horning Jun. 1972 26 p refs Sponsored by AEC
(SC-DR-720418) Avail: NTIS

The mechanisms for increases in saturation voltage as a result of neutron radiation are examined. It is concluded that the width of the collector epitaxial layer is the most important parameter in determining the susceptibility of a high voltage, high current device to radiation-induced increases in saturation voltage. It is shown that a particular type of storage time measurement should provide information about the epitaxial layer width, and therefore the individual device hardness. Experimental results indicate that storage time used in conjunction with low voltage, high current gain measurements provided sufficient information to categorize devices within a given group as to their respective hardness. Author (NSA)

N73-13807# Aerospace Corp., El Segundo, Calif. Lab. Operations.
AERONOMIC CONSEQUENCES OF SOLAR FLUX VARIATIONS BETWEEN 2000 AND 1325 A Report for 2 Nov. 1971 - 1 Mar. 1972
Edward L. Breig 15 Aug. 1972 45 p refs
(Contract F04701-72-C-0073)
(AD-747777; TR-0073(9260-01)-1; SAMSO-TR-72-179) Avail: NTIS CSCL 04/1

A theoretical analysis of the effects of recent solar flux measurements below 2000 A upon the basic atmospheric O2 photodissociation and heating rates as a function of the O2 column density has been performed. Such experimental data imply a reduction in these basic rates by up to a factor of 4 at the top of the atmosphere, as compared to those rates computed with previously recommended solar fluxes. These differences, however, are dependent upon the O2 column density and decrease for large values of the latter parameter. Atmospheric altitude profiles of the O2 dissociation and heating rates exhibit a comparable variation with the solar flux intensity at these wavelengths. Author (GRA)

N73-13808# Alaska Univ., College. Geophysical Inst.
STUDIES OF THE SOLAR AND TERRESTRIAL RADIATION FLUXES OVER ARCTIC PACK ICE Annual Report, 1 Jun. 1971 - 31 May 1972
Gunter Weller, Sue Ann Bowling, K. O. L. F. Jayaweera, Takeshi Ohtake, and Stan Parker Aug. 1972 75 p refs
(Contract N00014-71-A-0364-0001; ARPA Order 1783; NR Proj. 307-343)
(AD-748214; TR-2; AR-1) Avail: NTIS CSCL 04/1

Contents: Radiation regime of the arctic basin - studies at T-3, AIDJEX sites and barrow; Effects of arctic stratus clouds on the radiation regime; Composition of arctic clouds; Ice nuclei concentrations in the arctic region; Absorption and scattering by atmospheric aerosols; Theoretical aspects of radiative transfer in the arctic atmosphere; Theory, instrumentation, calibration and experimental procedure. GRA

N73-13809# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
RADIO OBSERVATIONS OF THE DISTRIBUTION OF CHROMOSPHERIC BRIGHTNESS TEMPERATURE
Fred I. Shimabukuro, M. Simon (State Univ. of N. Y., Stony Brook), D. Buhl (Natl. Radio Obs.), J. R. Cogdell (Tex. Univ., Austin), and C. Zapata (Lincoln Lab., MIT) 1 Mar. 1972 15 p refs
(Contract F04701-71-C-0172)
(AD-747021; TR-0172(2230-20)-16; SAMSO-TR-72-127) Avail: NTIS CSCL 03/2

Radio observations of the solar eclipse of 7 March 1970 were made at several observatories in a cooperative effort, covering a wavelength range of 2.1 mm to 2 cm. An analysis of the radio observations is given. Author (GRA)

N73-13810# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
VARIATION IN THE INTENSITY OF CIRCULARLY POLARIZED RADIO EMISSION DURING SOLAR FLARES
N. N. Ergushev and L. I. Tsvetkov 19 May 1972 12 p refs Transl. into ENGLISH from Solnechnye Dannye (USSR), no. 12, 1969 p 94-98
(AD-747606; FTD-MT-24-1693-71) Avail: NTIS CSCL 03/2

The behavior of circularly polarized radio emission observed at 3.15 cm during three solar flares on 10 and 12 July 1968 has been investigated. Variations of the intensity of polarized emission from the region of local sources were detected several hours before the appearance of a radio burst, as well as variations of the intensity (an oscillation pattern) during the bursts. Author (GRA)

N73-13811# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CERTAIN PROPERTIES OF REGIONS WITH PROTON FLARES
G. F. Eliseev and L. A. Elseeva 2 May 1972 14 p refs Transl. into ENGLISH from Soln. Dannye (USSR), no. 14, 1968 p 94-99

(AD-747426; FTD-MT-24-1624-71) Avail: NTIS CSCL 03/2
Regions with and without proton flares were compared statistically based on a complex of certain parameters of these regions. Some regularities of prognostic interest were detected. An attempt was made to forecast proton flares on the basis of these regularities. Author (GRA)

N73-13812# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
A MODEL FOR U-SHAPED SOLAR BURST SPECTRA
Gabor Kalman, Stanford Yukon, and Pradip Bakshi May 1972 63 p refs
(Contract F19628-72-C-0003)
(AD-747033; AFCRL-72-0324; SR-1) Avail: NTIS CSCL 03/2

A model, for U-shaped solar bursts based on one single group of moderately relativistic electrons radiating in an ambient cold magnetoplasma is presented. Results of computer calculations are discussed. Suggestions for comparison with observation are made. Speculations about the mechanism of proton acceleration are included. Author (GRA)

N73-13614 Joint Publications Research Service, Arlington, Va.
COMPARISONS OF THE NATIONAL STANDARDS FOR MEASURING SOLAR RADIATION
V. A. Klevantsova *In its* Meteorology and Hydrol., No. 7, Jul. 1972 28 Sep. 1972 p 92-94 refs (For availability see N73-13602 04-20)

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N73-13813 Illinois Univ., Urbana.
LUNAR CONTROL BY ORBITAL TRIANGULATION: AN ERROR ANALYSIS Ph.D. Thesis
Joseph John DelVecchio, Jr. 1971 143 p
Avail: Univ. Microfilms Order No. 72-6911

The National Aeronautics and Space Administration, along with the scientific community in general, established a requirement for three dimensional control networks on the surface of the moon and planets envisioned for exploration. Accuracy requirements, relative to the center of mass, have been stated for the Lunar Control Network. The photogrammetric generation of this Lunar Control Network is discussed. More specifically, it is concerned with the expected errors in the generated control network and with the satisfying of the stated requirements. The bulk of the investigation was accomplished by means of theoretical error analyses and photogrammetric triangulations with synthetic data. This data represented a specific camera configuration. The remainder of the investigation consisted of a theoretical extrapolation of these results to those which could be expected from other camera configurations. Dissert. Abstr.

N73-13814 California Univ., San Diego.
ASTROPHYSICAL FLOW PROBLEMS Ph.D. Thesis
Herbert Eugene Johnson 1971 145 p
Avail: Univ. Microfilms Order No. 72-7593

This dissertation consists of four problems involving astrophysics and space physics. The first problem discusses the He-3 balance in the earth's atmosphere. The thermal loss of He-3 for the period 1947-1968 is calculated on a daily basis using the Jeans escape formula. The second part discusses the possibility of an atmosphere on the planet Mercury. The third part discusses the steady, radial flow of a perfect gas in a spherically symmetric galaxy, taking into account the emission of gas from the stars comprising the galaxy and allowing for the presence of a central gravitating source or sink of gas. In the final chapter, a simple model which essentially neglects temperature effects, but which includes gravity, radiation pressure, photoionization, and charge exchange, is used to calculate the angular dependence of the intensity of solar Lyman alpha resonantly scattered from neutral interstellar hydrogen which has penetrated the solar system. Dissert. Abstr.

N73-13815 Stanford Univ., Calif.
EXTRAGALACTIC RADIO SOURCES Ph.D. Thesis
David Michael Mills 1971 81 p
Avail: Univ. Microfilms Order No. 72-5953

Extragalactic radio sources are usually double, with the two components, or radio clouds, located at distances up to approximately 200 kpc from the nucleus of the parent object. Recent high-resolution observations imply that the ejection velocity is typically small while the minimum internal pressure is quite high. The cloud must therefore be confined in some manner. On the basis of this model, a large fraction of the emission should originate in a bright, compact region at the front of the cloud, the remainder constituting a long, wide lower surface brightness tail extending back toward the parent object. Most of the polarized emission must originate in the tail: the intrinsic (zero-wavelength) polarization magnitude should be 5-15% with the electric vector perpendicular to the direction of motion. The polarization magnitude decreases monotonically with increasing wavelength due to differential internal Faraday rotation, while the corresponding change in polarization angle is small. Dissert. Abstr.

N73-13816 Washington Univ., Seattle.
TIDAL INTERACTIONS IN MULTIPLE GALAXIES Ph.D. Thesis
Martin Clutton-Brock 1971 239 p
Avail: Univ. Microfilms Order No. 72-7330

A set of bi-orthogonal pairs of functions is derived, which are specially suited for the calculation of the gravitational field of flat galaxies. They are Hankel transforms of Laguerre functions, or Hankel-Laguerre functions. Numerical computations are most efficiently performed in terms of a related set of Chebyshev functions: the necessary algorithms are derived using Hankel-Laguerre functions. Computer experiments were performed on the tidal perturbations of self gravitating disks by a fixed potential perturber. The stars were pulled out into diffuse clouds: the high velocity dispersion needed for stability made the formation of narrow filaments impossible. Gas clouds have a much lower velocity dispersion. A zero velocity dispersion, zero mass component was placed on top of the stellar disk to mimic the behavior of gas clouds. The gas clouds did indeed form remarkably narrow tails and well defined bridges. Dissert. Abstr.

N73-13817 Princeton Univ., N.J.
INHOMOGENEOUS MODELS OF THE ATMOSPHERE OF JUPITER Ph.D. Thesis
Leon Axel 1971 66 p
Avail: Univ. Microfilms Order No. 72-2683

Infrared observations and some general theoretical considerations lead to an inhomogeneous model of the Jovian atmosphere with two cloud layers: an upper semitransmitting cloud (assumed for simplicity to be negligibly thick) separated by a clear space from a lower cloud deck (assumed infinite in calculations). It is shown that the observed variation of the geometric albedo from the visible into the ultraviolet can be explained by the presence of fine absorbing dust in the atmosphere above the upper cloud deck. The apparent decrease of the geometric albedo from the visible into the infrared is shown to mostly result from molecular absorption bands, and it is argued that the continuum albedo remains high out to at least 1 micron. Dissert. Abstr.

N73-13818 Georgetown Univ., Washington, D.C.
PHOTOELECTRIC INVESTIGATIONS OF THE FAINT ECLIPSING VARIABLE STARS TY URSAE MAJORIS AND AZ VIRGINIS AND THE DETERMINATION OF THE SPECTRAL CLASSIFICATION FOR THE ECLIPSING VARIABLE STARS WY CANCRI, AZ VIRGINIS AND TZ BOOTIS Ph.D. Thesis
Harold Everett Durgin 1971 206 p
Avail: Univ. Microfilms Order No. 72-4218

Blue and yellow light curves were obtained for TY Ursae Majoris. The observed times of minima indicated a period of 0.35461426 days. This is considerably longer than periods derived by other investigators. Solutions for the orbital and eclipse elements were completed for both colors. The Fourier coefficients

obtained from an analysis of the light outside eclipse are compared with theoretical Fourier coefficients calculated using the adapted orbital elements. The photoelectric observations of AZ Virginis were made in order to better determine the period. Previous visual and photographic investigations indicated periods of 0.297 and 0.349 days. The findings in this study confirm the longer period. The spectra for the three eclipsing binaries, AZ Virginis, TZ Bootis, and WY Cancri were obtained. The MKK classification was utilized to determine the combined spectrum of each system as well as its luminosity class. Dissert. Abstr.

N73-13819 Cornell Univ., Ithaca, N.Y.
RADIO INTENSITY FLUCTUATIONS IN PULSARS Ph.D. Thesis
Donald Charles Backer 1971 254 p
Avail: Univ. Microfilms Order No. 72-7537

There exists a wide range of fluctuations in the radio intensity of pulsar emissions. One outstanding feature of these fluctuations in four pulsars is that the intensity variations within one pulse are correlated with those in succeeding pulses. Typically subpulses of emission appear on the trailing edge of the pulse, drift across the pulse, and disappear on the leading edge of the pulse five to ten pulse periods later. The three forms of subpulse structure are shown to be related to the perpendicular moment of the dipole magnetic field that is inferred from the spin-down rate, assuming the spindown arises from magnetic dipole radiation of a rotating, magnetized neutron star. The progression of increased order in the subpulse structure from the pattern form to the nonlinear to the linear corresponds to a decrease in the apparent dipole moment. Several considerations of pulsar models are discussed in terms of the data. Dissert. Abstr.

N73-13820 California Univ., Los Angeles.
PROBLEMS IN ESTIMATION THEORY WITH APPLICATIONS TO ORBIT DETERMINATION Ph.D. Thesis
David Walter Curkendall 1971 170 p
Avail: Univ. Microfilms Order No. 72-2797

Several problems in estimation theory with current application interest to orbit determination are treated. Although much of the material covered has general application, the important specific of interplanetary orbit determination is given special emphasis and is used throughout to provide context and to obtain numerical results. Topics covered include: modeling the errors in the navigation measurements, describing the navigation measurements compactly in terms of the unknown parameters, and describing the estimation accuracy in a variety of poorly modeled situations. The phase-coherent Doppler system used by NASA's Deep Space Net is modeled as a time-invariant linear system to determine the influence the master oscillator stability has on the resultant Doppler data accuracy. Analytical expressions for determining the errors introduced in spacecraft state estimates due to earth-based tracking station location errors and constant unmodeled forces acting on the probe are derived.
Dissert. Abstr.

N73-13821 Ohio State Univ., Columbus.
A STUDY OF SC STARS Ph.D. Thesis
Arthur Edward S. Greene 1971 278 p
Avail: Univ. Microfilms Order No. 72-4505

Several aspects were examined of the atomic and molecular spectra of stars that appear to be intermediate between the spectral classes S and C. Image-tube spectrograms covering the region from 3840 A to 7200 A at a dispersion of 66 A/mm were obtained for 51 stars including S, SC and carbon stars. These spectrograms were reduced by means of direct intensity traces and residual-intensity measurements were made of several atomic features due to Ba, Zr, Sc, La and Li. In the red spectral regions corrections were made for the blending of CN by comparing with synthetic CN spectra. Visual estimates were made of the strengths of the C2 Swan bands. To provide color temperatures and direct measurements of CN absorption, photometric data were obtained for 21 stars using an 8-color system that covers the region from 7100 A to 11,000 A. Temperature estimates of the remaining stars were made by comparing the energy distribution from their spectrograms with the spectrograms of these 21. Dissert. Abstr.

N73-13822 Ohio State Univ., Columbus.
OPTIMAL SELENODETIC CONTROL Ph.D. Thesis
Haim Bezion Papo 1971 271 p
Avail: Univ. Microfilms Order No. 72-4602

This study was undertaken to solve the problem of determination of an optimal selenodetic control network on the Moon. Selenodetic control is defined by the coordinates of a network of well identifiable features on the lunar surface with respect to a selenodetic Cartesian-coordinate system, which is fixed to the lunar crust, centered at its mass center and oriented along the three principal axes of inertia of the Moon. The solution is based on optical data obtained by photography or by direct angular observations of the Moon taken from the Earth or on board a spacecraft and on range and range-rate data obtained from tracking stations on Earth to a spacecraft orbiting the Moon. Numerical tests with the simulated as well as with real data demonstrated that the solution for the physical librations of the Moon conforms very closely to existing solutions while having many advantages primarily that of being an integral part of the control network solution. Dissert. Abstr.

N73-13823*# IIT Research Inst., Chicago, Ill.
COMET RENDEZVOUS MISSION STUDY
Alan L. Friedlander and William C. Wells Oct. 1971 166 p refs
(Contract NASw-2144)
(NASA-CR-129820; M-28) Avail: NTIS HC $10.50 CSCL 22B

Four periodic comets with perihelia between 1980 and 1986 (Encke, d'Arrest, Kipff, and Halley) are used as candidates for the comet rendezvous mission study. All these comet apparitions are especially favorable for rendezvous missions, because of early earth-based comet recovery, good opportunities to view their activity from earth, and reasonable launch vehicle and trajectory requirements for nominal payloads. Author

N73-13824*# IIT Research Inst., Chicago, Ill.
FIRST GENERATION ATMOSPHERIC PROBES (10-BARS) FOR URANUS AND NEPTUNE Final Report
R. J. Sullivan, J. I. Waters, and J. H. Dunkin Mar. 1972 94 p refs
(Contract NASw-2144)
(NASA-CR-129815; M-34) Avail: NTIS HC $6.75 CSCL 22A

The feasibility of atmospheric entry probe missions to Uranus and Neptune is studied, and preliminary estimates of missions parameters are presented. Most of the study results are applicable, with only minor modifications, to Uranus-Neptune entry probes included on any type of outer planet mission. Trajectory dynamics is discussed first because it imposes some important constraints upon the total time available for data transmission, which in turn determines the descent rate. This last quantity provides important information for the design of the scientific payload.
Author

N73-13825*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THE CALCULATION AND PUBLICATION OF A GRID OF LINE-BLANKETED MODEL STELLAR ATMOSPHERES Final Report
Eugene H. Avrett Nov. 1972 272 p refs
(Grant NGR-09-015-198)
(NASA-CR-129670) Avail: NTIS HC $15.75 CSCL 03B

The luminosity, mass, and elemental abundances, as well as other properties of each star are studied in order to locate them in an evolutionary pattern. A method for determining the flux, gravity, and abundances at the stellar surface is the construction of theoretical stellar atmospheric models that predict the observed energy distribution and detailed stellar spectrum.
Author

N73-13826# National Aerospace Lab., Tokyo (Japan).
ORBIT DETERMINATION AND CONTROL METHODS FOR SELF-CONTAINED STATION-KEEPING SYSTEMS
Koichi Matsushima Aug. 1972 22 p refs In JAPANESE; ENGLISH summary
(NAL-TR-295) Avail: NTIS HC $3.25

An orbit determination method for self-contained stationkeeping systems, using observational data of only on-board sensors,

is formulated. The general equations of motion which determine the motion of a satellite due to control forces in the earth's gravitational field are derived from Lagrange's planetary equations and the mechanism of orbit control is discussed from the dynamical point of view using the equations. Then the effects of the perturbations of the earth's gravitational field on the longitudinal drift of synchronous satellite are described, and it is shown that the stationkeeping of a synchronous satellite in the earth's gravitational field, having no consideration for the effects of other perturbative forces, results in the control of only two parameters, a and l. Author

N73-13827# City Univ., London (England). Dept. of Aeronautics.
GRAVITY-ASSISTED EXPLORATION OF THE OUTER PLANETS IN THE 1980'S
A. R. Martin Apr. 1972 35 p refs
(Aero-72/3) Avail: NTIS HC $3.75

Using a two-dimensional patched conic technique to calculate interplanetary orbits a study is made of the possibilities for gravity-assisted exploration of the outer planets of the solar system (with the exception of Pluto) in the 1980's. Use of both Jupiter and Saturn swingbys to perturb the spacecraft trajectories is considered. Full mission data is given in tabular and graphical form. It is found that 16 missions are possible in the 1980's and that another three can be launched in November 1979. The preliminary data given is useful in indicating mission trends and opportunities, and an example is given of a four spacecraft program, with a total duration of ten years, which provides for two separate flybys of the four major planets, as well as data on the interplanetary medium out to a distance of at least thirty astronomical units from the sun. Author

N73-13828+ La Plata Univ. (Argentina).
OBTAINING ROCKET TRAJECTORIES BY ANOLOGICAL-HYBRID COMPUTATION Final Report [OBTENCION DE TRAYECTORIAS DE COHETES MEDIANTE COMPUTACION ANALOGICA-HIBRIDA]
[1972] 47 p In SPANISH
Avail: NTIS HC $4.50

An analysis of the problems for determining projectile trajectories by analog-hybrid computation is presented which considers the influence of geographic coordinates, coriolis, reentry, and thrust. Topics discussed include: the equations of motion for a projectile with six degrees of freedom in the atmosphere; hybrid systems for generating digital functions; hybrid system with the dynamics of the control system simulated in an analog subsystem; simulation of space vehicles; and the mechanics of computing trajectories. Transl. by F.O.S.

N73-13829*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE FOR MANKIND'S BENEFIT
Jesco VonPuttkamer, ed. and Thomas J. McCullough, ed. Washington 1972 415 p refs A Space Congr. held at Huntsville, Ala., 15-19 Nov. 1971; sponsored by the Huntsville Assoc. of Tech. Soc. Original contains color illustrations
(NASA-SP-313; LC-72-600226) Avail: NTIS; SOD $4.50 CSCL 03B

The proceedings of a space congress held at Huntsville, Alabama during November 1971 are presented. The theme of the conference was Space for Mankind's Benefit. The subjects discussed were: (1) man in near-earth space, (2) fundamental benefits of the space program, (3) benefits of orbital surveys and space technology to environmental protection, (4) benefits to telecommunications, navigation and information systems, (5) benefits to future power generations and energy production, and (6) general technology utilization in the public sector. For individual titles, see N73-13830 through N73-13874.

N73-13830* TRW Systems Group, Redondo Beach, Calif.
UNMANNED SPACECRAFT FOR RESEARCH c31
Carl D. Graves *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 23-39 Original contains color illustrations (For availability see N73-13829 04-30)
CSCL 22B

The applications of unmanned spacecraft for research purposes are discussed. Specific applications of the Communication and Navigation satellites and the Earth Observations satellites are described. Diagrams of communications on world-wide basis using synchronous satellites are developed. Photographs of earth resources and geology obtained from space vehicles are included. P.N.F.

N73-13831* McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SKYLAB c31
George V. Butler *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 41-56 (For availability see N73-13829 04-30)
CSCL 22B

The Skylab program is presented to show the construction of the space vehicle and the facilities provided. The projects to be conducted during Skylab missions are described. The cost of the program is discussed and plans for future Skylab vehicles and missions are analyzed. Photographs of the interior of Skylab simulators are included to clarify the report. P.N.F.

N73-13832* General Dynamics/Convair, San Diego, Calif.
THE POTENTIAL IMPACT OF THE SPACE SHUTTLE ON SPACE BENEFITS TO MANKIND c31
Ivan Rattinger *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 57-76 (For availability see N73-13829 04-30)
CSCL 22A

The potential impact of the space shuttle on space benefits to mankind is discussed. The space shuttle mission profile is presented and the capabilities of the spacecraft to perform various maneuvers and operations are described. The cost effectiveness of the space shuttle operation is analyzed. The effects upon technological superiority and national economics are examined. Line drawings and artist concepts of space shuttle configurations are included to clarify the discussion. P.N.F.

N73-13833* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE PATH TO GLORY UNTOLD
Earl Hubbard *In its* Space for Mankind's Benefit 1972 p 77-80 (For availability see N73-13829 04-30)
CSCL 22A

A philosophical view of the development of the universe and mans' place in developing his cultural conditions are presented. The effects of population growth on the ecology are analyzed. Propositions for improving the conditions of mankind are presented. The influence of cybernation and automation on the development of space exploration are described. P.N.F.

N73-13834* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPLICATION OF NASA MANAGEMENT APPROACH TO SOLVE COMPLEX PROBLEMS ON EARTH c34
John S. Potate *In its* Space for Mankind's Benefit 1972 p 83-92 (For availability see N73-13829 04-30)
CSCL 05A

The application of NASA management approach to solving complex problems on earth is discussed. The management of the Apollo program is presented as an example of effective management techniques. Four key elements of effective management are analyzed. Photographs of the Cape Kennedy launch sites and supporting equipment are included to support the discussions. P.N.F.

N73-13835* Bendix Corp., Detroit, Mich.
OUR LEADERSHIP IN SCIENCE AND TECHNOLOGY AS PROVIDED BY THE NATIONAL SPACE PROGRAM
Winston E. Kock *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 93-95 (For availability see N73-13829 04-30)
CSCL 05A

The contributions of science and technology to the success of the United States as a world leader are discussed. Specific instances of the manner in which science advances and new technologies resulting from space research have contributed to a higher standard of living are presented. It is concluded that the benefits of the space program are not reflected only in the material advancements, but that intangible results have also been

achieved in greater incentives to improve the present culture.
P.N.F.

N73-13836* Committee on Science and Astronautics (U. S. House).
SPIRITUAL IMPACTS OF THE SPACE PROGRAM ON THE WORLD c34
Marvin Esch *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 97-98 (For availability see N73-13829 04-30)
CSCL 05K

The lessons learned from the space program in showing how fragile the environment is on earth are discussed. Examples are cited of the reactions of the astronauts to the unique features of earth. The reactions of the populace in seeking better living conditions and their concern with improving the environment are given as two outgrowths of the program. P.N.F.

N73-13837* Michigan Univ., Ann Arbor.
INTRIGUE AND POTENTIAL OF SPACE EXPLORATION
Hazel Losh *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 99-102 (For availability see N73-13829 04-30)
CSCL 05A

A brief history of astronomy is presented. A chronology of events in the space program is summarized. The possibilities of interplanetary exploration are postulated. The accomplishments of astronomy in pointing the way to manned spaceflight and improved understanding of the solar system are examined.
P.N.F.

N73-13838* International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
APPLICATION OF REMOTE SENSING TO SOLUTION OF ECOLOGICAL PROBLEMS c13
Andrew Adelman *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 105-108 (For availability see N73-13829 04-30)
CSCL 05K

The application of remote sensing techniques to solving ecological problems is discussed. The three phases of environmental ecological management are examined. The differences between discovery and exploitation of natural resources and their ecological management are described. The specific application of remote sensing to water management is developed. P.N.F.

N73-13839* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPLICATIONS OF REMOTE SENSING TO STREAM DISCHARGE PREDICTIONS c13
Fritz R. Krause and C. Byron Winn (Colo. State Univ.) *In its* Space for Mankind's Benefit 1972 p 109-119 refs (For availability see N73-13829 04-30)
CSCL 05H

A feasibility study has been initiated on the use of remote earth observations for augmenting stream discharge prediction for the design and/or operation of major reservoir systems, pumping systems and irrigation systems. The near-term objectives are the interpolation of sparsely instrumented precipitation surveillance networks and the direct measurement of water loss by evaporation. The first steps of the study covered a survey of existing reservoir systems, stream discharge prediction methods, gage networks and the development of a self-adaptive variation of the Kentucky Watershed model, SNOPSET, that includes snowmelt. As a result of these studies, a special three channel scanner is being built for a small aircraft, which should provide snow, temperature and water vapor maps for the spatial and temporal interpolation of stream gages. Author

N73-13840* Barringer Research Ltd., Rexdale (Ontario).
POSSIBILITIES OF OBSERVING AIR POLLUTION FROM ORBITAL ALTITUDES c20
A. Barringer *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 121-139 refs (For availability see N73-13829 04-30)
CSCL 04B

Research carried out over a number of years has indicated the feasibility of monitoring global air pollution from orbiting satellites. Optical methods show considerable promise of measuring the burdens of pollution, both gaseous and particulates. Important pollution gases, such as sulfur dioxide, nitrogen dioxide, carbon monoxide, and ozone, as well as some hydrocarbon vapors, appear amenable to optical remote sensing. Satellite platforms for carrying out this work would not compete with ground monitoring stations but rather supplement them with a different type of data which could be integrated with ground level measurements to provide an all-embracing picture of pollution buildup, mass migration, and dissipation. Author

N73-13841* Alabama Univ., University. Dept. of Civil and Medical Engineering.
USE OF DATA FROM SPACE FOR EARTH RESOURCES EXPLORATION AND MANAGEMENT IN ALABAMA c13
Phillip E. LaMoreaux (Ala. State Oil and Gas Board) and Harold R. Henry *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 143-148 (For availability see N73-13829 04-30)
CSCL 05F

The University of Alabama, the Geological Survey of Alabama, and the George C. Marshall Space Flight Center are involved in an interagency, interdisciplinary effort to use remotely sensed, multispectral observations to yield improved and timely assessment of earth resources and environmental quality in Alabama. It is the goal of this effort to interpret these data and provide them in a format which is meaningful to and readily usable by agencies, industries, and individuals who are potential users throughout the State. Author

N73-13842* Mississippi State Univ., State College.
A DATA ACQUISITION SYSTEM (DAS) FOR MARINE AND ECOLOGICAL RESEARCH FROM AEROSPACE TECHNOLOGY c14
Richard A. Johnson *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 149-153 refs (For availability see N73-13829 04-30)
(Grants NGL-25-001-028; NGL-25-001-032; NGL-25-001-040)
CSCL 14B

The efforts of researchers at Mississippi State University to utilize space-age technology in the development of a self-contained, portable data acquisition system for use in marine and ecological research are presented. The compact, lightweight data acquisition system is capable of recording 14 variables in its present configuration and is suitable for use in either a boat, pickup truck, or light aircraft. This system will provide the acquisition of reliable data on the structure of the environment and the effect of man-made and natural activities on the observed phenomenon. Utilizing both self-contained analog recording and a telemetry transmitter for real-time digital readout and recording, the prototype system has undergone extensive testing. Author

N73-13843* Allied Research Associates, Inc., Concord, Mass.
SATELLITE OBSERVATIONS OF TEMPORAL TERRESTRIAL FEATURES c13
George Rabchevsky *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 155-179 refs (For availability see N73-13829 04-30)
CSCL 05F

The application of satellite data to earth resources and environmental studies and the effects of resolution of the photographs and imagery are discussed. The nature of the data acquired by manned space flight and unmanned satellites is described. Specific applications of remotely sensed data for oceanography, hydrology, geography, and geology are examined.
P.N.F.

N73-13844* Pennsylvania State Univ., University Park.
INTERDISCIPLINARY APPLICATIONS AND INTERPRETATIONS OF REMOTELY SENSED DATA c13
G. W. Peterson and G. J. McMurtry *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 181-186 refs (For availability see N73-13829 04-30)
CSCL 05H

An interdisciplinary approach to use remote sensors for the inventory of natural resources is discussed. The areas under investigation are land use, determination of pollution sources

and damage, and analysis of geologic structure and terrain. The geographical area of primary interest is the Susquehanna River Basin. Descriptions of the data obtained by aerial cameras, multiband cameras, optical mechanical scanners, and radar are included. The Earth Resources Technology Satellite and Skylab program are examined. Interpretations of spacecraft data to show specific areas of interest are developed. Author

N73-13845* Battelle Columbus Labs., Ohio. Aerospace Mechanics Div.
ORBITAL SURVEYS AND STATE RESOURCE MANAGEMENT c13
George Wukelic, T. L. Wells (State of Ohio Dept. of Develop.), and B. R. Brace *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 187-197 refs (For availability see N73-13829 04-30)
CSCL 05F

The resource management implications of satellite earth resource surveys for the state of Ohio are discussed. Discussions cover environmental problems, planning future developments, and short- and long-range benefits of such resource management. E.H.W.

N73-13846* Colorado State Univ., Fort Collins.
RIVERBED FORMATION c13
Morris Skinner *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 199-210 refs Original contains color illustrations (For availability see N73-13829 04-30)

The general fluvial processes that work to form a riverbed and produce the characteristic pattern of either meandering, braided, or straight are reviewed. A method for quantification of river pattern and correlation, with the basic hydraulic characteristics of discharge and slope, is presented. Additional characteristics of a river system may be deduced from high-quality photography and imagery obtained from either aircraft or space platforms. Author

N73-13847* General Electric Co., Philadelphia, Pa. Missile and Space Div.
A LITTLE BEYOND TOMORROW
Daniel J. Fink *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 211-213 (For availability see N73-13829 04-30)
CSCL 05B

The present and long range benefits of space technology to man and his world are discussed. Data cover communications, education, earth resources, health, transportation, and manufacture of products in space. E.H.W.

N73-13848* Research Triangle Inst., Durham, N.C. Biomedical Application Team.
ADVANCEMENTS IN MEDICINE FROM AEROSPACE RESEARCH c04
F. Thomas Wooten *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 215-220 (For availability see N73-13829 04-30)
(Contract NASw-2273)
CSCL 06E

A program designed to find second applications for space technology in the medical field is described. Illustrative examples and clinical test results are included for prosthetic urethral devices, ear oximeter for monitoring leukemia patients, devices for measuring low level CO effects on automobile drivers, radiation dosimeter probe for detecting radiation levels in cancerous areas, and electromyographic muscle trainer. E.H.W.

N73-13849* General Electric Co., Philadelphia, Pa. Missile and Space Div.
DOMESTIC APPLICATIONS FOR AEROSPACE WASTE AND WATER MANAGEMENT TECHNOLOGIES c05
Frank DiSanto and Robert W. Murray *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 221-230 refs (For availability see N73-13829 04-30)
CSCL 06I

Some of the aerospace developments in solid waste disposal and water purification, which are applicable to specific domestic problems are explored. Also provided is an overview of the management techniques used in defining the need, in utilizing the available tools, and in synthesizing a solution. Specifically, several water recovery processes will be compared for domestic applicability. Examples are filtration, distillation, catalytic oxidation, reverse osmosis, and electrodialysis. Solid disposal methods will be discussed, including chemical treatment, drying, incineration, and wet oxidation. The latest developments in reducing household water requirements and some concepts for reusing water will be outlined. Author

N73-13850* International Business Machines Corp., Armonk, N.Y. Health Sciences.
BREATHING METABOLIC SIMULATOR c05
Roscoe G. Bartlett, Jr., C. M. Hendricks, and W. B. Morison *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 231-235 (For availability see N73-13829 04-30)
CSCL 06B

A description is given of an automatic computer-controlled second generation breathing metabolic simulator (BMS). The simulator is used for evaluating and testing respiratory diagnostic, monitoring, support, and resuscitation equipment. Any desired sequence of metabolic activities can be simulated on the device for up to 15 hours. The computer monitors test procedures and provides printouts of test results. E.H.W.

N73-13851* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
MEDICAL TECHNOLOGY ADVANCES FROM SPACE RESEARCH c05
Sam L. Pool *In its* Space for Mankind's Benefit 1972 p 237-244 refs (For availability see N73-13829 04-30)
CSCL 06B

Details of medical research and development programs, particularly an integrated medical laboratory, as derived from space technology are given. The program covers digital biotelemetry systems, automatic visual field mapping equipment, sponge electrode caps for clinical electroencephalograms, and advanced respiratory analysis equipment. The possibility of using the medical laboratory in ground based remote areas and regional health care facilities, as well as long duration space missions is discussed. E.H.W.

N73-13852* Lincoln Lab., Mass. Inst. of Tech., Lexington.
SATELLITE COMMUNICATION AND NAVIGATION FOR MOBILE USERS c17
Steven L. Bernstein *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 247-257 (For availability see N73-13829 04-30)
CSCL 17B

Efforts made to utilize space technology for solving communication and navigation problems faced by mobile users in earth orientated situations are outlined. Applications include transoceanic airline communications, reliable long range ship-shore communications, emergency communications in regions with rough terrain, and military operations. E.H.W.

N73-13853* Page Communications Engineers, Inc., Washington, D.C.
A NEW DEVICE FOR COMMUNICATION SYSTEMS c17
R. R. Beck *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 259-264 (For availability see N73-13829 04-30)
CSCL 17B

A communication device and modulation capability were developed for the transmission of digital data or voices from point to point. This device is a fast-switching phase coherent frequency synthesizer. When this synthesizer is appropriately incorporated in a communication system it can provide interference resistance, multiple-user capability, user identification, ranging, navigation, Doppler correction, and digitized communication (voice and data). The application of this device to aircraft/airport complex and law enforcement communications is discussed. Author

N73-13854* Communications Satellite Corp., Washington, D.C.
COMMUNICATIONS VIA SATELLITE - DIVIDEND OF THE SPACE AGE c17
Gustave J. Rauschenbach *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 265-277 (For

availability see N73-13829 04-30)
CSCL 17B

The revolution in communication caused by satellites is discussed. Particular attention is given to the INTELSAT and international system over the Atlantic, Pacific, and Indian oceans. E.H.W.

N73-13855* Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.
DEVELOPMENT AND APPLICATION OF COLOR TELEVISION FOR APOLLO 15 AND BEYOND c17
Samuel Russell *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 279-284 (For availability see N73-13829 04-30)
CSCL 17B

The development of the television system used for Apollo 15 mission is discussed. Data cover identification of factors contributing to the high quality of pictures generated on the lunar surface and exploration of several possible present and future uses of the television equipment developed. Author

N73-13856* American Science and Engineering, Inc., Cambridge, Mass.
ADVANCES IN HIGH ENERGY ASTRONOMY FROM SPACE
Riccardo Giacconi *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 287-301 (For availability see N73-13829 04-30)
CSCL 04A

Observational techniques, derived through space technology, and examples of what can be learned from X-ray observations of a few astronomical objects are given. Astronomical phenomena observed include the sun, stellar objects, and galactic objects. E.H.W.

N73-13857* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BENEFITS OF SPACE RESEARCH TO THE NATURAL SCIENCES
John A. OKeefe *In its* Space for Mankind's Benefit 1972 p 303-306 (For availability see N73-13829 04-30)
CSCL 06C

The use of space technology to develop techniques and devices to help support the American dollar and determine the origin of the moon and solar system is discussed. E.H.W.

N73-13858* Kentucky Univ., Lexington.
THE OUTER PLANETS - FLY-BY PROSPECTS
W. D. DeMarcus *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 307-311 (For availability see N73-13829 04-30)
CSCL 22A

The projected benefits of flyby missions to the outer planets are discussed. Possible changes in existing theories of planetary composition as a result of such missions are also discussed. E.H.W.

N73-13859* Boeing Co., Huntsville, Ala. Saturn/Apollo/Skylab Div.
THE HUMAN VALUE OF SCIENTIFIC INVESTIGATIONS OF THE ORIGIN AND EVOLUTION OF THE SOLAR SYSTEM
J. L. Archer *In* NASA. Marshall Space Flight Center Space for Mankind's Benefits 1972 p 313-321 refs (For availability see N73-13829 04-30)
CSCL 03B

The value of space exploration in relation to such earth bound problems as poverty, hunger, overpopulation, pollution, disease, and urban blight is discussed. E.H.W.

N73-13860* National Aeronautics and Space Administration, Washington, D.C.
STATUS AND PLANS OF NASA'S MATERIALS SCIENCE AND MANUFACTURING IN SPACE (MS/MS) PROGRAM
William O. Armstrong and James H. Bredt *In its* Space for Mankind's Benefit 1972 p 325-332 (For availability see N73-13829 04-30)
CSCL 05A

A description is given of a research and development program on the space shuttle mission designed to prepare the way for possible commercial manufacturing operations on permanently orbiting space stations. E.H.W.

N73-13861* Massachusetts Inst. of Tech., Cambridge. Center for Materials Sciences and Engineering.
SPACE ENVIRONMENT: A NEW DIMENSION IN THE PREPARATION OF UNIQUE SOLIDS
Harry C. Gatos *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 333-335 (For availability see N73-13829 04-30)
CSCL 13H

The preparation of solids, particularly electronic solids in space is discussed. Particular attention is given to the effect of nongravitational environments on the development of homogeneous materials that cannot be manufactured on earth. E.H.W.

N73-13862* General Electric Co., Philadelphia, Pa. Missile and Space Div.
SPACE PROCESSING: A PROJECTION
Louis R. McCreight and R. N. Griffin *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 337-340 refs (For availability see N73-13829 04-30)
CSCL 13H

Estimates concerning space manufacturing, which might well become the largest and most specific application of space technology by the end of the century are given. Two classes of materials are considered - electronic crystals and biologicals. Author

N73-13863* North American Rockwell Corp., Downey, Calif. Space Div.
EXTRATERRESTRIAL IMPERATIVE c34
Krafft A. Ehricke *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 341-352 (For availability see N73-13829 04-30)
CSCL 03B

The future benefits of extraterrestrial space to man and his problems, both personal and environmental, are discussed. Particular attention was given to space manufacturing, development of space power plants, mineral exploration, and transportation costs of such activities. E.H.W.

N73-13864* Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
POWER AND ENERGY FOR POSTERITY c23
Robert F. Barthelemy and Robert F. Cooper *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 355-359 (For availability see N73-13829 04-30)
CSCL 10B

The use of sophisticated space energy generation and storage systems to benefit the general public was examined. The utilization of these systems for pollution-free generation of energy to satisfy mankind's future electrical, thermal, and propulsion needs was of primary concern. Ground, air, and space transportation; commercial, peaking, and emergency electrical power; and metropolitan and unit thermal energy requirements were considered. Each type of energy system was first analyzed in terms of its utility in satisfying the requirement, and then its potential in reducing the air, noise, thermal, water, and nuclear pollution from future electrical and thermal systems was determined. Author

N73-13865* Tennessee Univ., Tullahoma. Space Institute.
CONTRIBUTIONS FROM SPACE TECHNOLOGY TO CENTRAL POWER GENERATION c03
John B. Dicks, Jr. *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 361-368 refs (For availability see N73-13829 04-30)
(Contracts F44620-69-C-0031; DI-14-32-0001-1213)
CSCL 10B

The central power crisis, and the present and relatively near-time contributions that aerospace technology is making to help solve this crisis are discussed. The principal emphasis is placed on the prospects of aerospace derived magnetohydrodynamic (MHD) large scale power generation. The strides that the Soviet Union is making in this field with the startup of the new U-25 plant near Moscow, having a total power capability of 75

MW, are reviewed. A much smaller program in the U.S. is outlined, and prospects of future benefits are discussed. Author

N73-13866* Florida Univ., Gainesville. Solar Energy and Energy Conversion Lab.
SOLAR ENERGY, ITS CONVERSION AND UTILIZATION **c03**
Erich A. Farber *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 369-388 (For availability see N73-13829 04-30)
CSCL 10C

The work being carried out at the University of Florida Solar Energy and Energy Conversion Laboratory in converting solar energy, our only income, into other needed and useful forms of energy is described. A treatment such as this demonstrates, in proper perspective, how solar energy can benefit mankind with its many problems of shortages and pollution. Descriptions were given of the conversion processes, equipment, and performance. The testing of materials, solar water heating, space heating, cooking and baking, solar distillation, refrigeration and air-conditioning, work with the solar furnace, conversion to mechanical power, hot air engines, solar-heated sewage digestion, conversion to electricity, and other devices will be discussed. Author

N73-13867* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPLICATION OF SPACE BENEFITS TO EDUCATION **c34**
Konrad K. Dannenberg and Frederick I. Ordway, III (Ala. Univ., Huntsville) *In its* Space for Mankind's Benefit 1972 p 391-396 Prepared in cooperation with Ala. Univ., Huntsville (For availability see N73-13829 04-30)
CSCL 05B

Information on the conducting of a teacher workshop is presented. This educational pilot project updated instruction material, used improved teaching techniques, and increased student motivation. The NASA/MSFC industrial facilities, and the displays at the Alabama Space and Rocket Center (ASRC) were key elements of the program, including a permanent exhibit, at the latter, on selected benefits accruing from the space program. Author

N73-13868* Howard Univ., Washington, D.C.
FROM SPACE: OUR HOUSING HOPES? **c34**
L. Alberto Scipio, II *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 397-421 refs (For availability see N73-13829 04-30)
CSCL 05A

The utilization of space developments - materials advances, new building methods, and systematic design and building management - to solving earthbased housing problems is discussed. Author

N73-13869* Wisconsin Univ., Madison. Space Science and Engineering Center.
BENEFITS TO BE DERIVED FROM METEOROLOGICAL SATELLITE TECHNOLOGY **c20**
Delbert D. Smith *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 423-429 (For availability see N73-13829 04-30)
CSCL 04B

The benefits derived from satellite technology in educational communication and meteorology are cited. E.H.W.

N73-13870* Little (Arthur D.), Inc., Cambridge, Mass. Engineering Sciences Section.
POWER WITHOUT POLLUTION **c03**
Peter E. Glaser *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 431-439 refs (For availability see N73-13829 04-30)
CSCL 10B

Details of several methods of converting solar energy to power without pollution are given. Data cover technical, economic, and social issues. E.H.W.

N73-13871* George Washington Univ., Washington, D.C. International Studies Group.
THE POLITICAL AND LEGAL ASPECTS OF SPACE APPLICATIONS **c34**
John Hanessian, Jr. *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 443-447 (For availability see N73-13829 04-30)
CSCL 05D

The political and legal repercussions of space programs both domestic and foreign are explored. Emphasis is placed on earth resources exploration (exploration based on information rights), jurisdictional problems, problems of sharing space benefits with other countries, criminal launch and use of satellites, intrusion into territorial sovereignty, and problems of establishing data ownership. E.H.W.

N73-13872* Alabama A & M Univ., Normal. Center of Intercultural Studies.
SPACE EXPLORATION AND WORLD PEACE **c34**
Charles Mercieca *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 449-452 (For availability see N73-13829 04-30)
CSCL 05K

The possibility of using space exploration as an instrument in procuring world peace is studied. Suggestions for obtaining such a peace, utilizing space programs, include removal of worldwide educational and communication barriers, building of an emotionally and socially stable society, creation of a unit or whole world rather than the mine and yours concept, and reevaluation and reorientation of human relations and values. E.H.W.

N73-13873* Washington Univ., St. Louis, Mo. Center for Development Technology.
APPLICATION OF COMMUNICATION SATELLITES TO EDUCATIONAL PROGRAMS **c34**
Jai P. Singh *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 453-456 (For availability see N73-13829 04-30)
CSCL 05B

Educational services which telecommunications satellites can provide and the design of systems used to deliver these services to the user are discussed. E.H.W.

N73-13874* Embassy of France, Washington, D.C.
SPACE BENEFITS TO MANKIND AS SEEN FROM A FRENCH POINT OF VIEW **c34**
Jean-Pierre M. Pujes *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 457-459 (For availability see N73-13829 04-30)
CSCL 05K

Benefits to mankind from space as determined from the French space programs are outlined. Data cover improved photographs for predicting numerical atmospheric parameters, monitoring natural resources via satellite from increased aircraft and balloon heights, and the use of satellites as navigation aids. The use of space research to improve international cooperation is also discussed. E.H.W.

N73-13875# National Environmental Satellite Service, Washington, D.C.
GEOSTATIONARY SATELLITE POSITION AND ATTITUDE DETERMINATION USING PICTURE LANDMARKS
William J. Dambeck Aug. 1972 24 p refs
(NOAA-TM-NESS-21) Avail: NTIS HC $3.25

Given a truly geostationary satellite, it is theoretically possible to determine both its position and attitude from the relative orientation of landmarks in pictures from the satellite. Several attempts to exploit this possibility are presented. Author

N73-13876# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 289
29 Nov. 1972 84 p refs Transl. into ENGLISH from various Russian articles
(JPRS-57630) Avail: NTIS HC $6.25

Translations and abstracts are presented of articles on meteorology, oceanography, upper atmosphere and space research, astronomy, and terrestrial geophysics, covering both science news and formal scientific reports. Author

N73-13877*# Texas Center for Research, Austin.
A STUDY OF NUMERICAL METHODS FOR COMPUTING REENTRY TRAJECTORIES FOR SHUTTLE-TYPE SPACE VEHICLES Final Report
[1972] 51 p refs
(Contract NAS9-11964)
(NASA-CR-128652) Avail: NTIS HC $4.75 CSCL 22A

The reuseable exterior insulation system (REI) is studied to determine the optimal reentry trajectory for a space shuttle, which minimizes the heat input to the fuselage. The REI is composed of titanium, covered by a surface insulation material. The method of perturbation functions was used to generate the trajectories, and proved to be an effective technique for generating families of solutions, once an initial trajectory has been obtained.
F.O.S.

N73-13878*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE MARINER 6 AND 7 PICTURES OF MARS
Stewart A. Collins Washington NASA 1971 168 p Sponsored by NASA Original contains color illustrations
(NASA-SP-263; LC-78-610670) Avail: NTIS; SOD $4.25 CSCL 03A

A comprehensive set of high quality reproductions of the final, computer-processed television pictures of Mars is presented. The genesis and unique characteristics of the pictures are explained, interesting features are pointed out, and some indication of their significance in the history of Mars investigations is provided. Author

N73-13879*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LUNAR ORBITER PHOTOGRAPHIC ATLAS OF THE MOON
David E. Bowker and J. Kenrick Hughes Washington 1971 723 p refs Original contains color illustrations
(NASA-SP-206; LC-70-607341) Avail: NTIS; SOD $19.25 CSCL 03B

A selection of the reconstructed photographs taken during 1966 and 1967 by five Lunar Orbiters is presented. The selection provides essentially complete coverage of the near and far sides of the moon in detail. The photographs were reprocessed from the original video data tapes. Author

N73-13880*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OAO-2 OBSERVATIONS OF LY AUR
Sara R. Heap Nov. 1972 38 p refs Submitted for publication
(NASA-TM-X-66131; X-671-72-461) Avail: NTIS HC $4.00 CSCL 03B

The eclipsing binary, LY Aur (09.5 III) was observed over a period of four days in March 1972 with the Wisconsin instrumentation on OAO-2. Complete light curves were obtained at the following wavelengths: 4250, 3320, 2980, 2460, 1910, and 1550 A. The phase resolution is usually 0.017. A solution of each light curve was attempted according to the Russell-Merrill method, but no solution was found. Author

N73-13881*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SMOOTHING OF FUNCTIONS OF RANGE AND RANGE RATE MEASUREMENTS FROM EARTH ORBITING SATELLITES
T. J. Grenchik and C. W. Murray, Jr. Oct. 1972 126 p ref Submitted for publication
(NASA-TM-X-66126; X-551-72-385) Avail: NTIS HC $8.50 CSCL 22C

It is shown that for satellites in circular Earth orbits with altitudes of 500 kilometers to 1500 kilometers, and for satellites in elliptical orbits with an approximate 4000 kilometer height of perigee, a high degree least squares polynomial (e.g., a 9th or 10th degree in some cases) is required to smooth both range and range rate data for purposes of input to orbit determination programs. In order to circumvent this problem, functions of range and range rate are smoothed with lower degree least squares polynomials (e.g., 3rd and 4th degree) and it is shown that under the above geometric constraints the standard deviation of fit can be reduced to levels commensurate with typical S-band tracking system resolution which is 1 to 2 meters in range and 0.005 meters/second in range rate for a 1 per second data rate. Also shown are the effects of Gaussian random noise, biases, and periodic noise. This analysis includes numerous examples applied to the 44 point data smoothing interval currently used in much of the operational preprocessing at the Goddard Space Flight Center. Author

N73-13882# Joint Publications Research Service, Arlington, Va.
WATER ON PLANETS
V. Derpgolts 7 Dec. 1972 24 p Transl. into ENGLISH from Nauka i Zhizn (Moscow), no. 4, 1972 28 p
(JPRS-57709) Avail: NTIS HC $3.25

A summary of information available on the occurrence of water in the universe is presented. A large number of photographs is included. Author

N73-13883*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HELIUM IN THE TOPSIDE VENUS IONOSPHERE
J. R. Herman Nov. 1972 15 p refs Submitted for publication
(NASA-TM-X-66128; X-621-72-439) Avail: NTIS HC $3.00 CSCL 03B

The quantity of helium in the Venus atmosphere is estimated from an examination of the measured ionization profiles. The amount of helium necessary to give agreement between the computed and experimental results is approximately 4 x 10 to the 8th power/cucm at 140 km. When an eddy diffusion coefficient of 1,000,000 sq cm/see is used, the atmospheric helium mixing ratio is found to be 0.0006; a value nearly ten times that for earth. Author

N73-13884*# Texas Center for Research, Austin.
A USER'S GUIDE FOR A GENERALIZED INTERPLANETARY TRAJECTORY GENERATION PROGRAM
17 Jun. 1972 18 p
(Contract NAS9-11964)
(NASA-CR-128655) Avail: NTIS HC $3.00 CSCL 22A

The analysis, structure, and capability of a generalized precision interplanetary trajectory computation program are discussed, with emphasis being placed on the description of input and output. Sample cases showing input and output information are included. Author

N73-13885*# Teledyne Brown Engineering, Huntsville, Ala.
SKYLAB EXPERIMENT PERFORMANCE EVALUATION MANUAL. APPENDIX N: EXPERIMENT S183 ULTRAVIOLET PANORAMA (MSFC), REVISION 1
K. S. Purushotham Nov. 1972 74 p refs Revision
(Contract NAS8-21804)
(NASA-CR-61386) Avail: NTIS HC $5.75 CSCL 22A

A series is presented of analyses for Experiment S183, Ultraviolet Panorama (MSFC), to be used for evaluating the performance of the Skylab corollary experiments under preflight, inflight, and post-flight conditions. Experiment contingency plan workaround procedure and malfunction analyses are presented in order to assist in making the experiment operationally successful. Author

N73-13886# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE - SCIENTIFIC AFFAIRS, NO. 285
4 Dec. 1972 24 p refs Transl. into ENGLISH from various Eastern European periodicals
(JPRS-57663) Avail: NTIS HC $3.25

The serial report contains articles concerning the development of and progress in the various theoretical and applied scientific disciplines and technical fields; and the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences. Author

N73-13887*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE VLBI TIME DELAY FUNCTION FOR SYNCHRONOUS ORBITS
B. Rosenbaum Jul. 1972 24 p ref Submitted for publication
(NASA-TM-X-66122; X-553-72-286) Avail: NTIS HC $3.25

CSCL 22C
The VLBI is a satellite tracking technique that to date was applied largely to the tracking of synchronous orbits. These orbits are favorable for VLBI in that the remote satellite range allows continuous viewing from widely separated stations. The primary observable, geometric time delay is the time difference for signal propagation between satellite and baseline terminals. Extraordinary accuracy in angular position data on the satellite can be obtained by observation from baselines of continental dimensions. In satellite tracking though, the common objective is to derive orbital elements. A question arises as to how the baseline vector bears on the accuracy of determining the elements. Our approach to this question is to derive an analytic expression for the time delay function in terms of Kepler elements and station coordinates. The analysis, which is for simplicity based on elliptic motion, shows that the resolution for the inclination of the orbital plane depends on the magnitude of the baseline polar component and the resolution for in-plane elements depends on the magnitude of a projected equatorial baseline component. Author

N73-13888*# Techtran Corp., Glen Burnie, Md.
PRELIMINARY DATA ON LUNAR SOIL COLLECTED BY THE LUNA-20 AUTOMATIC STATION
A. P. Vinogradov Washington NASA Dec. 1972 19 p Transl. into ENGLISH from Geokhimiya (Moscow), no. 7, 1972 p 763-774
(Contract NASw-2037)
(NASA-TT-F-14615) Avail: NTIS HC $3.00 CSCL 03B
Examination of rock samples collected by the Luna-20 automatic space station has revealed considerable differences between the continental and mare rock formations on the Moon, especially in regard to iron. Author

N73-13889# European Space Research Organization, Paris (France).
INTRODUCTION TO SPACE ASTRONOMY
A. Gaide May 1972 81 p refs Presented at Conf. held at CERN, Geneva, 23-25 Mar. 1971
(ESRO-SP-75) Avail: NTIS HC $6.25
The major observations, present applications, and principal goals of gamma, x, ultraviolet and infrared research for space astronomy are reviewed. A brief summary of the major properties of radiative sources and radiative transfer is also given.
Author (ESRO)

N73-13890# Naval Research Lab., Washington, D.C.
TRIP TRAJECTORY INTEGRATION PROGRAM. PROGRAM DESCRIPTION AND USE Final Report
Bernard Kaufman 18 Jul. 1972 101 p refs
(AD-747588; NRL-7436) Avail: NTIS CSCL 22/3
The report describes a numerical integration computer program (called TRIP) based on Encke's method of integrating only the perturbations in the cartesian coordinates. The mathematical model can include Venus, Earth, Mars, Jupiter, the Moon, and the Sun as either central or disturbing bodies. In addition, full gravity field potentials are included for the Earth (7X7) and Moon(4X4) and J2 only for Mars. Modification to expand the gravity models for the other planets is simple. Solar radiation pressure may also be included as an option in the input. The program uses the latest exported JPL double-precision planetary ephemerides (DE 19). TRIP has the option of calculating shadow times of penumbra and umbra; printout may be obtained at specified times or, in the case of a planetary orbiter, at apoapsis or periapsis. Input data is very simple and there is a variety of coordinate systems for printout. Author (GRA)

N73-13891# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
COMPARISON OF THE PATCHED-CONIC AND LINEARIZATION METHODS IN THE SOLUTION OF THREE-BODY PROBLEMS M.S. Thesis
Thomas M. Conley Jun. 1972 76 p refs
(AD-748345; GA/MC/72-2) Avail: NTIS CSCL 22/3
The accuracy of the patched-conic and linearization methods in predicting trajectories in a Sun-Planet system are compared. Forty-two series of trajectories were computed for forty-two different assumed initial positions and velocities. Each series consisted of an integrated three-body trajectory, a linearized trajectory and a two-body trajectory. It was shown that for all cases in which the linearization theory applied, this method was more accurate than the patched-conic method in approximating the actual three-body trajectory. It was further shown that in some cases the linearization method could be applied where the patched-conic method could not. Author (GRA)

N73-13892# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MAGNETIC ASYMMETRY AND VARIATIONS OF THE GENERAL MAGNETIC FIELD OF THE SUN
A. B. Severnyi 7 Apr. 1972 74 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Krym. Astrofiz. Observ. (USSR), v. 38, 1968 p 3-51
(AD-746717; FTD-MT-24-1445-71) Avail: NTIS CSCL 03/2
The paper deals with a study of the influence of the resolving power of the magnetograph on the statistic results as the mean field strength, the average wavelength, and the number of magnetic elements of different polarites. The results of the study proved that at unchanged magnetic flux the mean field strength increases 1.3 to 1.4 times, the wavelength decreases 1.2 to 1.3 times when the resolving power of the instrument is increased from 27 to 1.5 arc sec. Twenty-four magnetographic records of northern and southern solar regions have been obtained, measured, and analyzed. Author (GRA)

N73-13893# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LONG PERIOD VARIABLE STARS OF THE MIRA CETA TYPE, CHAPTER 9
Ya. Ya. Ikaunieks 16 Jun. 1972 47 p refs Transl. into ENGLISH from Pulsiruyushchie Zvezdy (Moscow), 1970 p 305-349
(AF Proj. 6103; AF Proj. 7660)
(AD-747564; FTD-MT-24-2103-71) Avail: NTIS CSCL 03/2
The report discusses the characteristics of a group of variable giant stars of the Mira Ceti type having periods from 80 to 1000 days and characteristic emission spectra similar to those of the later spectral classes ME, CE and SE. Special attention is given to U, B and V photometry and IR electrophotometry of these stars. Studies of IR stars of this group are reviewed. Other topics include the visible spectral region and the spectral effects of shock waves and light absorption in the atmospheres of these stars. Their mean absolute magnitudes and their distribution in space are calculated and their kinematic characteristics are analyzed. The difficulties encountered when attempting to explain the mechanism of variability of these stars are noted.
Author (GRA)

N73-13894# Aerospace Corp., El Segundo, Calif. Lab. Operations.
A CATALOG OF TEN-MICRON CELESTIAL OBJECTS, SUPPLEMENT 1 Technical Report, Mar. - Apr. 1972
Richard T. Hall 15 Aug. 1972 17 p
(Contract F04701-72-C-0073)
(AD-747776; TR-0172(9260-01)-17-1; SAMSO-TR-72-177) Avail: NTIS CSCL 03/2
Fifty-one objects for which new observations have been reported are listed. The format of this supplement is the same as that of Parts 1 through 4 of the Catalog. Author (GRA)

N73-13895# Owens Valley Radio Observatory, Pasadena, Calif.
HIGH RESOLUTION INTERFEROMETRIC OBSERVATIONS OF VENUS AT THREE RADIO WAVELENGTHS, 7
G. L. Berge, D. O. Muhleman, and G. S. Orton 1972 24 p refs
(Contract N00014-67-A-0094-0019)
(AD-747992; Rept-1972-7) Avail: NTIS CSCL 03/2
The authors present new 6.0 and 21.1 cm interferometric observations of Venus. When combined with our previous 3.12 cm work they provide a self-consistent set of high-resolution observations at three wavelengths covering a range in which the opacity of the Venus atmosphere varies by a factor of fifty. Model calculations indicate that a model atmosphere of CO2 in adiabatic equilibrium containing uniformly mixed gaseous absorbers surrounding a dielectric sphere cannot simultaneously and adequately predict the radio interferometric measurements

at all wavelengths together with the radar and radio occulation measurements. Author (GRA)

N73-13896# Owens Valley Radio Observatory, Pasadena, Calif.
A NEUTRAL HYDROGEN STUDY OF THE COMPACT GALAXY II Zw 40, 8
S. T. Gottesman (Fla. Univ.) and L. Weliachew 1972 21 p refs
(Contract N00014-67-A-0094-0019)
(AD-747993; Rept-1972-8) Avail: NTIS CSCL 03/2

Interferometric observations at the 21 cm neutral hydrogen emission line have yielded information about the dynamics and structure of the compact galaxy II Zw 40. The neutral hydrogen follows a core-halo distribution with characteristic Gaussian half-power widths of 52 arc sec and 350 arc sec.
Author (GRA)

N73-13897# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
METHODS FOR DETERMINING THE FIGURE AND GRAVITY FIELD OF THE MOON
N. A. Chuykova Aug. 1972 18 p refs Transl. into ENGLISH from Moscow Univ. Vestnik. seriya 3 (Fizika, Astronomiya) (USSR), no. 5, 1969 p 81-88
(AD-747875; DMAAC-TC-1847) Avail: NTIS CSCL 03/2

Five methods presently available for determining the figure and gravity field of the moon are considered in this work: the hydrostatic theory, observations of the physical libration of the moon, the motion of the perigee and the node of the lunar orbit, the trajectory variations of the motion of artificial satellites of the moon and the observable topography. The obtained information makes it possible to propose some hypotheses concerning the internal structure of the moon. Author (GRA)

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also; 28 Propulsion Systems; and 32 Structural Mechanics.

N73-13898* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VORTEX BREECH HIGH PRESSURE GAS GENERATOR Patent
James E. Pleasants and Viggo G. Derreng, inventors (to NASA) Issued 24 Oct. 1972 9 p Filed 22 Jan. 1971 Supersedes N72-11792 (10 - 02, p 0256)
(NASA-Case-LAR-10549-1; US-Patent-3,700,192; US-Patent-Appl-SN-108824; US-Patent-Class-244-139; US-Patent-Class-60-291) Avail: US Patent Office CSCL 22B

The design and development of a gas generator to be used in deploying a recovery parachute from a space capsule during reentry is discussed. A vortex breech is employed with the gas generator to separate unburned propellant particles from the high pressure gases to preclude damage to the recovery parachute.
Official Gazette of the U.S. Patent Office

N73-13899 California Univ., San Diego.
ABLATION EFFECTS OF THE DYNAMIC STABILITY OF REENTRY VEHICLES Ph.D. Thesis
Guy Paul Lengelle 1971 161 p
Avail: Univ. Microfilms Order No. 72-6524

A theoretical analysis to investigate the possibility of a strong influence of the protective material ablation on the dynamic stability of a reentry vehicle is presented. Order of magnitude estimates, using Newtonian theory, of the inviscid and viscous pressure forces show that such a strong effect could occur. The boundary layer is shown to respond in a quasisteady manner to changing external conditions and the analysis is intended primarily to describe the fully nonstationary response of the ablating material. In this sense it can be considered to complement the relevant existing theoretical and experimental studies which consider the material response to be an undetermined parameter. Small oscillations with respect to steady mean values are considered and linearization is employed. Dissert. Abstr.

N73-13900*# IIT Research Inst., Chicago, Ill.
PRELIMINARY RADAR SYSTEMS ANALYSIS FOR VENUS ORBITER MISSIONS
R. K. Brandenburg and D. J. Spadoni Nov. 1971 90 p refs
(Contract NASw-2144)
(NASA-CR-129821; M-32) Avail: NTIS HC $6.50 CSCL 22B

A short, preliminary analysis is presented of the problems involved in mapping the surface of Venus with radar from an orbiting spacecraft. Two types of radar, the noncoherent sidelooking and the focused synthetic aperture systems, are sized to fulfill two assumed levels of Venus exploration. The two exploration levels, regional and local, assumed for this study are based on previous Astro Sciences work (Klopp 1969). The regional level is defined as 1 to 3 kilometer spatial and 0.5 to 1 km vertical resolution of 100 percent 0 of the planet's surface. The local level is defined as 100 to 200 meter spatial and 50-10 m vertical resolution of about 100 percent of the surface (based on the regional survey). A 10cm operating frequency was chosen for both radar systems in order to minimize the antenna size and maximize the apparent radar cross section of the surface.
Author

N73-13901*# Chrysler Corp., New Orleans, La. Space Div.
CHRYSLER UPPER STAGE SIZING EVALUATION ROUTINE (CUSSER). VOLUME 1: USER'S MANUAL
P. D. Thompson and G. M. Joseph 30 Jun. 1972 205 p refs
(Contract NASw-2294)
(NASA-CR-129590; TR-AP-72-5-Vol-1) Avail: NTIS HC $12.25 CSCL 22B

A computer program was developed as a preliminary design computational tool for use in upper stage studies. The computer program determines the size, weight and cost of upper stages for either specified payloads or gross (payload plus stage) weights. The program is capable of sizing stages for missions having N burns, with each having a different payload. The routine also has provisions to size the stage for use in conjunction with a specified booster or launch vehicle. This allows the upper stage to supplement the booster in achieving a specified initial velocity. The program was written in FORTRAN V for operation on a UNIVAC 1108 digital computer, and requires a core storage of approximately 60 K. The program uses two magnetic tape drives, one for a propellant properties and engine data tape and the other for a scratch tape.
Author

N73-13902*# Chrysler Corp., New Orleans, La. Space Div.
CHRYSLER UPPER STAGE SIZING EVALUATION ROUTINE (CUSSER). VOLUME 2: PROGRAMMER'S MANUAL
P. D. Thompson and G. M. Joseph 30 Jun. 1972 351 p refs
(Contract NASw-2294)
(NASA-CR-129589; TR-AP-72-5-Vol-2) Avail: NTIS HC $19.75 CSCL 22B

For Abstract See N73-13901

N73-13903*# Chrysler Corp., New Orleans, La. Space Div.
UPPER STAGE TECHNOLOGY EVALUATION STUDIES
31 Aug. 1972 272 p refs
(Contract NASw-2294)
(NASA-CR-129587; TR-AP-72-6) Avail: NTIS HC $15.75 CSCL 22B

Studies to evaluate advanced technology relative to chemical upper stages and orbit-to-orbit stages are reported. The work described includes: development of LH2/LOX stage data, development of data to indicate stage sensitivity to engine tolerance, modified thermal routines to accommodate storable propellants, added stage geometries to computer program for monopropellant configurations, determination of the relative gain obtainable through improvement of stage mass fraction, future propulsion concepts, effect of ultrahigh chamber-pressure increases, and relative gains obtainable through improved mass fraction. F.O.S.

N73-13904*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PRESSURE SIGNATURES FOR THE APOLLO COMMAND MODULE AND THE SATURN 5 LAUNCH VEHICLE WITH A DISCUSSION OF STRONG SHOCK EXTRAPOLATION PROCEDURES
Raymond M. Hicks, Joel P. Mendoza, and Charles L. Thomas Apr. 1972 31 p refs
(NASA-TM-X-62117) Avail: NTIS HC $3.75 CSCL 22B

Wind tunnel pressure signatures measured at Mach 10.1 for model of the Apollo Command Module and at Mach numbers from 3.01 to 7.91 for two models of the Saturn launch configuration are presented. The signatures for the command module were obtained at roll angles ranging from 0 deg to 180 deg. A brief discussion of the extrapolation of strong pressure signatures is included in the report. Author

N73-13905*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WIND TUNNEL PRESSURE SIGNATURES FOR A .016 SCALE MODEL OF THE APOLLO COMMAND MODULE
Joel P. Mendoza and Raymond M. Hicks Jul. 1971 47 p refs
(NASA-TM-X-62047) Avail: NTIS HC $4.50 CSCL 22B

Pressure signatures were measured at roll angles ranging from 0 to 180 deg for a .016-scale model of the Apollo Command Module spacecraft at 25 deg angle of attack. The test Mach numbers ranged from 1.50 to 10.02. Author

N73-13906*# Thiokol Chemical Corp., Ogden, Utah. Wasatch Div.
TECHNICAL ENGINEERING SERVICES IN SUPPORT OF THE NIKE-TOMAHAWK SOUNDING ROCKET VEHICLE SYSTEM Final Report, May 1970 - Nov. 1972
14 Nov. 1972 20 p
(Contract NAS5-21172)
(NASA-CR-130123) Avail: NTIS HC $3.00 CSCL 16D

Task assignments in support of the Nike-Tomahawk vehicles, which were completed from May 1970 through November 1972 are reported. The services reported include: analytical, design and drafting, fabrication and modification, and field engineering. F.O.S.

N73-13907*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
DELTA-90 INTERPLANETARY MONITORING PLATFORM-H (IMP-H) Operations Summary Report
15 Sep. 1972 38 p
(NASA-TM-X-68880; KSC-TR-1196) Avail: NTIS HC $4.00 CSCL 25B

The operations summary for the IMP-H spacecraft is presented. The subjects discussed are: (1) mission objective, (2) description of launch vehicle and spacecraft, (3) mission plan, (4) flight plan, and (5) post launch operations. Details of the mission are presented in drawings and tables of data. Author

N73-13908*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
SPACE SHUTTLE MAINTENANCE PROGRAM PLANNING DOCUMENT
Darwin V. Brown 17 Jul. 1972 30 p
(NASA-TM-X-69004; KSC-TR-1187) Avail: NTIS HC $3.50 CSCL 22B

A means for developing a space shuttle maintenance program which will be acceptable to the development centers, the operators (KSC and AF), and the manufacturer is presented. The general organization and decision processes for determining the essential scheduled maintenance requirements for the space shuttle orbiter are outlined. The development of initial scheduled maintenance programs is discussed. The remaining maintenance, that is non-scheduled or non-routine maintenance, is directed by the findings of the scheduled maintenance program and the normal operation of the shuttle. The remaining maintenance consists of maintenance actions to correct discrepancies noted during scheduled maintenance tasks, nonscheduled maintenance, normal operation, or condition monitoring. Author

N73-13909*# Grumman Aerospace Corp., Bethpage, N.Y.
DESIGN OF A SPACE SHUTTLE STRUCTURAL DYNAMICS MODEL Final Report, Jun. - Oct. 1972
Oct. 1972 86 p
(Contract NAS1-10635-11)
(NASA-CR-112205) Avail: NTIS HC $6.50 CSCL 22A

A 1/8 scale structural dynamics model of a parallel burn space shuttle has been designed. Basic objectives were to represent the significant low frequency structural dynamic characteristics while keeping the fabrication costs low. The model was derived from the proposed Grumman Design 619 space shuttle. The design includes an orbiter, two solid rocket motors (SRM) and an external tank (ET). The ET consists of a monocoque LO2 tank an interbank skirt with three frames to accept SRM attachment members, an LH2 tank with 10 frames of which 3 provide for orbiter attachment members, and an aft skirt with one frame to provide for aft SRM attachment members. The frames designed for the SRM attachments are fitted with transverse struts to take symmetric loads. Author

N73-13910*# Chrysler Corp., New Orleans, La. Space Div.
AERODYNAMIC STATIC STABILITY AND CONTROL EFFECTIVENESS OF A PARAMETRIC SHUTTLE LAUNCH CONFIGURATION Space Shuttle
Paul E. Ramsey Dec. 1972 685 p
(Contract NAS8-4016)
(NASA-CR-120088; DMS-DR-2006) Avail: NTIS HC $36.25 CSCL 22B

Experimental aerodynamic investigations were conducted in the NASA/MSFC 14-inch Trisonic Wind Tunnel on a 0.004-scale model of the NR ATP baseline Shuttle launch configuration. The test model consisted of the NR ATP baseline orbiter, external tank, and SRB's with nozzles. Six component aerodynamic force and moment data were recorded over an angle of attack range from minus 10 deg to 10 deg at zero degrees sideslip and angle of sideslip range of minus 10 deg to 10 deg at zero angle of attack for a Mach range of 0.6 to 4.96. Rudder flare was constant at 10 deg during the entire test. The purpose of the test was to define the performance, stability, and control characteristics of the launch configuration as well as to investigate the buildup effect of two geometrical parameters. Author

N73-13911*# Grumman Aerospace Corp., Bethpage, N.Y.
PRELIMINARY SHUTTLE STRUCTURAL DYNAMICS MODELING DESIGN STUDY
Nov. 1972 171 p refs Prepared in cooperation with TRW Systems Group, Redondo Beach, Calif.
(Contract NAS1-10635)
(NASA-CR-112196) Avail: NTIS HC $10.75 CSCL 22B

The design and development of a structural dynamics model of the space shuttle are discussed. The model provides for early study of structural dynamics problems, permits evaluation of the accuracy of the structural and hydroelastic analysis methods used on test vehicles, and provides for efficiently evaluating potential cost savings in structural dynamic testing techniques. The discussion is developed around the modes in which major input forces and responses occur and the significant structural details in these modes. Author

N73-13912*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
UK-4 FLIGHT SPACECRAFT MAGNETIC TESTS
W. E. Pruett Apr. 1972 31 p refs
(NASA-TM-X-66125; X-325-72-376) Avail: NTIS HC $3.75 CSCL 22B

Magnetic tests conducted on the UK-4 spacecraft are discussed. The objectives of the test are: (1) to determine the permanent, induced, and stray magnetic moments of the spacecraft, (2) to assess its magnetic stability, (3) to determine the dipole moment produced by energizing the magnetorquer coil, (4) to measure the despin torque due to eddy current and magnetic hysteresis, and (5) to deperm, compensate, and make other adjustments necessary to achieve satisfactory magnetic characteristics for the spacecraft. Author

N73-13913*# National Aeronautics and Space Administration, Washington, D.C.
THE 10 YEAR USSR KOMOS STAELLITE PROGRAM
Rudolf Hofstaetter Dec. 1972 31 p Transl. into ENGLISH from Flug Revue Flugewelt Intern., no. 10, Oct. 1972 p 37-40
(NASA-TT-F-14641) Avail: NTIS HC $3.50 CSCL 22C

The Soviet Kosmos satellite and rocket programs are described. These satellites were used to investigate solar radiation, astronomical data, astrophysical data, the earth's atmosphere, space biology and other areas of research. Author

N73-13914*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
INTERACTION OF THE SPACE SHUTTLE CONTROL SYSTEM WITH POGO
A. Stewart Hopkins and William F. Davis Washington NASA Dec. 1972 67 p
(Contract NAS1-11055)
(NASA-CR-2154; MDC-G2961) Avail: NTIS HC $3.00 CSCL 22B

The asymmetric configuration of the space shuttle results in coupled pitch and axial vibration modes. This coupling results in interaction between the pogo and control systems. A detailed model of representative space shuttle structure, feedline, control, and engine systems revealed the coupled system may be unstable even though the pogo and control systems are stable individually. A method is developed for predicting the coupled system stability in terms of the stability of the separate systems. Author

N73-13915# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
APOGEE IMPULSE OPTIMIZATION DURING THE LAUNCH INTO ORBIT OF A GEOSTATIONARY SATELLITE Final Report [OPTIMISATION DE L'IMPULSION D'APOGEE LORS DE LA MISE EN PLACE D'UN SATELLITE GEOSTATIONNAIRE RAPPORT FINAL]
D. Biausse, J. P. Marec, and F. Depasse Jul. 1972 156 p refs In FRENCH; ENGLISH summary
(Contract ESOC-369/71/14)
(ONERA-NT-2/1895-SY; ESRO-CR(P)-131) Avail: NTIS HC $10.00

Positioning of a geostationary satellite is discussed. The direction of the apogee impulse, the injection time, the nominal apogee distance, and the nominal magnitude of the apogee impulse are analytically determined in order to minimize the size of the orbit correction tank. Dispersions of the transfer orbit, the magnitude and the direction of the apogee velocity increment are taken into account, assuming that the transfer orbit elements are measured with a limited accuracy. This implies that the optimum orbit correction strategy, and the optimum stochastic apogee impulse, must be found. The optimum nominal apogee distance and the optimal nominal apogee velocity increment must also be determined stochastically. The performance index to be maximized is the probability of performing the transfer corrections with a velocity increment less than or equal to a given value. The size of the orbit correction tanks is easily found from this value. Author (ESRO)

N73-13916# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
KINETHEODOLITE OBSERVATIONS MADE AT EARLY-BURN ON SATELLITE 1964-76 A FROM NOVEMBER 1965 TO MARCH 1966
K. S. Russell 20 Oct. 1972 26 p ref
(ROE-STS-131) Avail: NTIS HC $3.50

Estimated azimuth and elevation values of the satellite 1964-76A recorded during 22 transits are given. ESRO

N73-13917# Battelle Columbus Labs., Ohio.
THE COLLECTION, GENERATION, AND ANALYSIS OF MIL-HDBK-5 ALLOWABLE DESIGN DATA Annual Report, 15 Feb. 1971 - 15 Feb. 1972
Paul E. Ruff, Ronald J. Favor, and Walter S. Hyler Mar. 1972 83 p refs
(Contract F33615-71-C-1381)
(AD-748268; AFML-TR-72-61) Avail: NTIS CSCL 22/2

MIL-HDBK-5, is the primary source for design allowable data for metallic materials, fasteners, joints, and other structural elements used in the design of aerospace vehicles. Battelle's Columbus Laboratories (BCL) provides the planning, coordination, and implementation activities necessary to maintain current design allowable data in the Handbook. The services provided by BCL for the MIL-HDBK-5 program involve the following: an assessment of the design data requirements of the aerospace industry; liaison with appropriate Government agencies, military services, aerospace contractors, and metallic material suppliers; collection of data; statistical analysis of data to determine design allowable properties; preparation of proposals which contain the revisions to MIL-HDBK-5 for the incorporation of new data; presentation of these proposals at the twice-yearly Government-industry coordination meetings for approval; and revision of MIL-HDBK-5 to incorporate these approved changes. Author (GRA)

N73-13918# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A SPACE RESCUE/UTILITY VEHICLE FEASIBILITY STUDY M.S. Thesis
James H. Diffendorfer Jun. 1972 84 p refs
(AD-748346; GA/MC/72-3) Avail: NTIS CSCL 22/1

A preliminary design study was conducted to determine the feasibility of performing space rescue, resupply, and reconnaissance with a glide-type reentry vehicle. It was assumed the 15,000 pound rescue vehicle could be boosted to a 100 nm circular orbit by a Titan 3-D launch vehicle. From this parking orbit, orbital transfer, rendezvous, and deorbit capability were determined. A reentry trajectory analysis was performed and showed that a crossrange of 2,000 nm could be attained. Heating analysis indicated that the reentry problem could be overcome with currently available engineering materials. Due to a relatively small onboard incremental velocity capability, only limited use as a rescue vehicle is planned. Author (GRA)

N73-13919# Naval Research Lab., Washington, D.C.
THE SOLRAD 10 SATELLITE, EXPLORER 44, 1971-058A Interim Report
Donald M. Horan and Robert W. Kreplin 12 Jul. 1972 54 p refs
(AD-748992; NRL-7408) Avail: NTIS CSCL 22/2

The Naval Research Laboratory's SOLRAD 10 satellite, also known as Explorer 44 or 1971-058A, was launched on July 8, 1971. The satellite is equipped with sensors to measure solar X-ray and ultraviolet radiation in the following bands: 15 to 150 keV, 0.1 to 1.6 A, 0.5 to 3 A, 1 to 5 A, 1 to 8 A, 16 A, 1 to 20 A, 44 to 60 A, 170 to 700 A, 1080 to 1350 A, 1225 to 1350 A, and 1450 to 1600 A. It also carries an experiment designed to search for radiation in the 0.5 to 15 A band from nonsolar sources. The satellite is equipped with a data storage system which can accept data from almost all solar experiments with a 1-minute or a 3-minute resolution. The satellite continuously transmits data in real-time at 137.710 MHz. The experiment complement aboard SOLRAD 10 is described in detail, and the information needed to convert the telemetered data to solar flux values is provided. Author (GRA)

N73-13920# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTINOMETRIC EQUIPMENT OF SOVIET METEOROLOGICAL SATELLITES
V. A. Beskin, V. L. Gaevskii, V. V. Zenkov, L. B. Krasilshchikov, B. V. Khlopov, V. A. Khrustalev, and G. I. Shuster 11 Aug. 1972 13 p Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 221, 1968 p 3-7
(AD-749622; FTD-MT-24-283-72) Avail: NTIS CSCL 04/1

The article describes some of the actinometric equipment used on Soviet meteorological satellites to measure (1) the outgoing emittance of Earth and atmosphere, and (2) the effective radiation temperature of the terrestrial surface and clouds. Two actinometric instrument types make up a standard equipment package: (1) a narrow-angle lucimeter, (2) a wide-angle flux-density meter. The instruments are described and the more important technical specifications are cited. Author (GRA)

N73-13830* TRW Systems Group, Redondo Beach, Calif.
UNMANNED SPACECRAFT FOR RESEARCH
Carl D. Graves *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 23-39 Original contains color illustrations (For availability see N73-13829 04-30)
CSCL 22B

N73-13831* McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

SKYLAB
George V. Butler *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 41-56 (For availability see N73-13829 04-30)
CSCL 22B

N73-13832* General Dynamics/Convair, San Diego, Calif.
THE POTENTIAL IMPACT OF THE SPACE SHUTTLE ON SPACE BENEFITS TO MANKIND
Ivan Rattinger *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 57-76 (For availability see N73-13829 04-30)
CSCL 22A

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N73-13921* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
FOLDABLE CONSTRUCTION BLOCK Patent
William C. Huber and Dale L. Ritter, inventors (to NASA) Issued 18 Dec. 1972 5 p Filed 18 Jan. 1971 Supersedes N71-31415 (09 - 18, p 3022)
(NASA-Case-MSC-12233-2; US-Patent-3,702,520; US-Patent-Appl-SN-107298; US-Patent-Class-52-284; US-Patent-Class-52-594; US-Patent-Class-229-DIG.11) Avail: US Patent Office CSCL 13M

A construction block foldable from a flat sheet of material to form a container which may be filled with available solid material and stacked with other such blocks in staggered courses is described. Interlock tabs project from the center of one horizontal wall of the block and the other horizontal wall is provided with a lateral, central slot arranged to receive interlock tabs from other such blocks. The block may be folded to provide either two symmetrical lateral interlock tabs for making lateral wall runs, or to provide lateral and transverse tabs for wall corners.
Official Gazette of the U.S. Patent Office

N73-13922 Georgia Inst. of Tech., Atlanta.
SOME DISCUSSIONS ON THE STABILITY OF STRUCTURAL AND MECHANICAL SYSTEMS Ph.D. Thesis
Milton Harold Bank, II 1971 165 p
Avail: Univ. Microfilms Order No. 72-5059

Non-destructive evaluation of the stability of shells, and the use of an unstable mechanical device in the design of an ultra-high g crash simulator are discussed. The investigation of the structural problem begins with an experimental study of elliptical shells under axial compressive load. It turns then to the non-destructive evaluation of rotationally restrained columns, and culminates in the development of a general method of non-destructive evaluation of shells. The design of a prime mover for an instantaneous 200g crash simulator is discussed. Two feasible design approaches are outlined. The first is based on the use of momentum transfer, and the second on direct force generation. The study indicates that the latter has greater potential. It obtains its characteristics from the use of a mechanical system displaced from a position of unstable equilibrium. Dissert. Abstr.

N73-13923*# North American Rockwell Corp., Downey, Calif. Space Div.
DEVELOPMENT AND FABRICATION OF A GRAPHITE POLYIMIDE BOX BEAM
M. A. Nadler and F. J. Darms 29 Sep. 1972 233 p
(Contract NAS8-24511)
(NASA-CR-123959; SD-72-SA-0171) Avail: NTIS HC $13.75 CSCL 13B

The state-of-the-art of graphite/polyimide structures was evaluated and key design and fabrication issues to be considered in future hardware programs are defined. The fabrication and testing at 500 F of a graphite/polyimide center wing box beam using OV-10A aircraft criteria was accomplished. The baseline design of this box was developed in a series of studies of other advanced composite materials: glass/epoxy, boron/epoxy, and boron/polyimide. The use of this basic design permits ready comparison of the performance of graphite/polyimide with these materials. Modifications to the baseline composite design were made only in those areas affected by the change of materials. Processing studies of graphite fiber polyimide resins systems resulted in the selection of a Modmor II/Gemon L material.
Author

N73-13924*# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.
AN EXPERIMENTAL-THEORETICAL STUDY OF FREE VIBRATIONS OF PLATES ON ELASTIC POINT SUPPORTS
Thomas R. Leuner Jul. 1972 104 p refs
(Grant NGR-31-001-146)
(NASA-CR-112220; AMS-1052) Avail: NTIS HC $7.25 CSCL 20K

A theoretical and experimental study is made to investigate the effect on plate vibrations of varying the stiffness of corner elastic point supports. A theoretical model is developed using a Rayleigh-Ritz analysis which approximates the plate mode shapes as products of free-free beam modes. The elastic point supports are modelled both as massless translational springs, and springs with tip masses. The tip masses are included to better represent the experimental supports. An experiment is constructed using the bending stiffness of horizontal beams to support a square plate at its four corners. The stiffness of these supports can be varied over such a range that the plate fundamental frequency is lowered to 40% of the rigid support frequency. The variation with support stiffness of the frequencies of the first eight plate modes is measured, and compared with the theoretical results. The plate mode shapes for rigid supports are analyzed using holographic interferometry. There is excellent agreement between the theoretical and experimental results, except for high plate modes where the theoretical model is demonstrated to be inadequate.
Author

N73-13925# Aeronautical Research Labs., Melbourne (Australia).
A PROBABILISTIC APPROACH TO STRUCTURAL DESIGN
J. M. Grandage and A. O. Payne Feb. 1972 48 p refs
(ARL/SM-Rept-337) Avail: NTIS HC $4.50

Reliability theory is used to determine the risk function and probability of failure for structures under ultimate load and under a wear-out process such as fatigue. Representative data are obtained for a high strength steel aircraft structure, and numerical integration methods are developed for evaluating the risk function. The application of the reliability approach to structural design is discussed.
Author

N73-13926# National Aerospace Lab., Amsterdam (Netherlands).
EFFECTS OF TEST FREQUENCY ON FATIGUE CRACK PROPAGATION UNDER FLIGHT-SIMULATION LOADING
J. Schijve 31 Mar. 1972 19 p refs Presented at AGARD Symp. on Random Load Fatigue, Lyngby, Denmark, 13 Apr. 1972
(NLR-MP-72010-U; ICAF-Doc-594) Avail: NTIS HC $3.00

Fatigue crack propagation in 2024-T3 and 7075-T6 sheet material was studied at three test frequencies, 10, 1 and 0.1 cycles per second. The flight-simulation loading was based on a gust spectrum. The design stress level was adopted as a second variable of the investigation. Differences between the crack propagation rates at the three test frequencies were small and unsystematic. The propagation was much slower than predicted from constant-amplitude test data. Moreover, the macro-cracking behaviour appeared to be different. In the discussion attention is paid to interaction with environmental effects and to implications for practical problems of aircraft fatigue.
Author

N73-13927# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
STRESS WAVES IN FINITE LONGITUDINALLY-LAYERED SHELLS
M. Ziv Jun. 1972 62 p refs
(TAE-154) Avail: NTIS HC $5.25

The transient response of a finite longitudinally-layered cylindrical membrane shell impacted by longitudinal axisymmetric loads is obtained. Membrane stress distribution and particles' velocities are determined for the entire solution domain. The

method of solution consists of characteristics finite difference technique and discontinuity relations. A characteristics finite difference integration scheme is constructed for regions where the variables are continuous. Discontinuities relations are developed to encounter the impulsive leading wave and its reflection and refraction at the interfaces. An example problem which demonstrates the method is solved. Author

N73-13928*# Techtran Corp., Glen Burnie, Md.
ERRORS DUE TO NONSTATIONARY THERMAL CONDITIONS IN THE MEASUREMENT OF STATIC STRAINS WITH SEMICONDUCTOR RESISTANCE STRAIN GAUGES
G. M. Kharitonov and O. M. Khitrova Washington NASA Dec. 1972 9 p refs Transl. into ENGLISH from Tepl. Napryazh. Elem. Konstr. (Kiev), no. 11, 1971 p 204-208
(Contract NASw-2037)
(NASA-TT-F-14616) Avail: NTIS HC $3.00 CSCL 29K

It has been shown experimentally that intense heating (cooling) of the test structure can lead to dynamic errors in strain measurements both as a result of the difference in the strain gauge and surface temperatures and the distortion of the temperature field at the surface by the strain gauge. The magnitude and sign of the error depend on a number of factors, including the rate of temperature variation, the wall thickness, the thermophysical characteristics of the wall material, the thickness of the protective coating, and the thickness of the strain gauge base. Author

N73-13929*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STRUCTURAL PANEL Patent Application
Liam Robert Jackson, inventor (to NASA) Filed 29 Nov. 1972 12 p
(NASA-Case-LAR-11052-1; US-Patent-Appl-SN-310611) Avail: NTIS HC $3.00 CSCL 13H

A panel is fabricated from several pairs of elongate hollow ribs. The ribs of each pair are located on opposite sides of the panel and the ribs on each side of the panel are in parallel side by side adjacency. The ribs of a pair may be superposed directly over one another or they may be offset laterally. Each rib is formed by a sheet member which is part-circular (semi-circular) in section along its entire length. At least one rib of each pair is considered to have three portions which in some embodiments are distinct while in others they are not. In any event, each portion of at least one is part-circular in section and the central portion, which may occupy up to 70 deg of a circle having its center on either side of the rib. The other rib may be symmetrical and, in any event, is part-circular in section. The structure produces a very strong light-weight panel. NASA

N73-13930*# Florida Technological Univ., Orlando.
MINIMUM WEIGHT DESIGN OF RING AND STRINGER STIFFENERS FOR AXIALLY COMPRESSED CYLINDRICAL SHELLS WITH AND WITHOUT INTERNAL PRESSURE
David L. Block Washington NASA Dec. 1972 85 p refs
(Grant NGR-10-019-002)
(NASA-CR-2165; RTU-5500) Avail: NTIS HC $3.00 CSCL 20K

Results of analytical study to determine desirable ring and stringer stiffener parameters and proportions for axially compressed stiffened isotropic cylinders with and without internal pressure are presented. This investigation examines the panel and general instability buckling modes of a stiffened cylindrical shell and from this determines desirable stiffener parameters and proportions. Classical buckling equations are used which retain the important effects of the stiffeners. The results determined by using the simpler classical buckling equations are then spot checked and verified using buckling equations which considered discrete ring stiffeners and nonlinear prebuckling deformations. For both rings and stringers, T-shaped stiffeners are preferable and the effects to stiffener shape are much more pronounced at low or zero values of the internal pressure parameter. Simple analytical expressions are developed and presented which express the stiffener area parameter, the ratio of stiffener area and elastics to shell wall area and elastic modulus, in terms of the cylinder geometry and internal pressure parameter. Author

N73-13931# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE ORTHOGONALITY OF NATURAL VIBRATIONS MODES OF A THIN ELASTIC SHELL
A. L. Goldenveizer [1972] 9 p refs Transl. into ENGLISH from "Problemy Mekhaniki Tverdogo Deformirovannogo Tela" Sudpromgiz, Leningrad, 1970 p 121-128
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The orthogonality of natural vibration modes of thin elastic shells is discussed. Mathematical models of the equilibrium equations; strain, displacement, and angle of rotation formulas; and elasticity relationships are presented. It is concluded that all the orthogonality theorems formulated in the report are provisional. They are based on the assumption of the existence of nontrivial solutions of the homogeneous boundary value problem governing the vibrations of this kind. It is further concluded that nontrivial solutions of the appropriate approximate boundary value problems will always exist for quasi-transverse vibrations. Author

N73-13932# Aktiebolaget Atomenergi, Stockholm (Sweden).
THE INTERRELATIONSHIP OF THE CREEP AND STRESS RELAXATION PHENOMENA
K. Gott, R. Lagneborg, and B. Modeer Sep. 1971 20 p refs
(STU-70-419/U-350-b; AE-MF-232) Avail: AEC Depository Libraries

Creep and stress relaxation tests were performed on a 20 Cr - 35 Ni austenitic stainless steel at 700 C. The results were evaluated using the recovery-creep model of Lagneborg and also the steady-state creep power law. Both models were also applied in a slightly modified form to the relaxation results. Good agreement was found between the experimental results and the recovery-creep model. Author

N73-13933# Skoda Works, Pilsen (Czechoslovakia). Nuclear Power Construction Dept.
SAFETY OF STRUCTURES AGAINST THE BRITTLE FAILURE
K. Kalna 1972 27 p refs Presented at 2d Czech. Symp. on Fractures, Marianske Lazne, Czechoslovakia, 20-22 Oct. 1970
(ZJE-118; Conf-701070-1) Avail: AEC Depository Libraries

Basic criteria used for the evaluation of a structure safety against brittle fracture are transition temperature, fracture toughness, and crack opening displacement. The applicability of criteria and their advantages are discussed. Fracture toughness tests are described in terms of testing procedure and the method of evaluation of test records. Selection of the most acceptable specimen type is discussed for individual tests. In order to define the safety of a structure, its dependence of yield stress and tensile strength on the temperature, the dependence of crack arrest temperature on the nominal stress, and the dependence of the fracture toughness on the temperature must be known. The acceptable length of a crack with respect to safe operating conditions of the structure may be determined by defining these parameters. Author (NSA)

N73-13934# Central Electricity Generating Board, Berkeley (England). Berkeley Nuclear Labs.
METHOD FOR THE DETERMINATION OF THE CRITICAL STRESS INTENSITY FACTOR NECESSARY FOR FATIGUE CRACK PROPAGATION
E. K. Priddle and K. Jerram Jan. 1972 18 p refs
(RD/B/N-2143) Avail: AEC Depository Libraries

The importance of the determination of the critical stress intensity for crack propagation, particularly in relation to reactor components, is discussed. Existing experimental methods are reviewed and attention is drawn to the lack of published data. A new method is described which was developed for use with an Amsler Vibrophore fatigue machine. Standard compact tension type test specimens are used, and the cyclic stress intensity factor automatically reduces as the crack propagates. The critical value of stress intensity is determined when propagation ceases. It was concluded that the technique is ecomonical in terms of material and operator effort, and shows practical advantages over the alternative available methods. Recent work using this technique is reported for EN3A, a structural mild steel. Author (NSA)

N73-13935# Liege Univ. (Belgium). Service des Points et Charpentes.

BUCKLING TESTS ON DOUBLE T PROTENAX STEEL PROFILES [ESSAIS DE FLAMBEMENT SUR PROFILS EN DOUBLE T EN ACIER PROTENAX]
P. Guiaux Sep. 1972 47 p refs In FRENCH Sponsored by IRSIA
(CRIF-MT-78) Avail: NTIS HC $4.50

Buckling tests were carried out on double T shaped beams in IPE 180 steel and in HE 180 B Protenax steel. Compression tests and drawing tests were also performed on short bars. Results have been tabulated and lead to the conclusion that the standards set up by the European convention for steel construction are still valid for steels of a class higher than AE 36.
Author (ESRO)

N73-13936# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ELASTOPLASTIC STRESSES AND DEFORMATIONS IN A PERFORATED PLATE Ph. D. Thesis - Paris Univ. [CONTRAINTES ET DEFORMATIONS ELASTOPLASTIQUES DANS UNE PLAQUE TROUEE]
Roger Ohayon 1972 47 p refs In FRENCH; ENGLISH summary
(ONERA-NT-193) Avail: NTIS HC $4.50

The stress and strain fields near the point of maximum load in a perforated plate (circular central hole) are determined, taking into account plasticity effects. The method used has the advantage of introducing predetermined stress and strain fields together. These fields are defined by trigonometric truncated series, in which the unknown coefficients are functions determined by solutions of a first order linear and homogeneous system of differential equations with nonconstant coefficients. The stress-strain relation adopted is the Prandtl-Reuss type with isotropic work hardening.
Author (ESRO)

N73-13937# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CALCULATION OF VISCOPLASTIC STRAINS IN STRUCTURES SUBJECTED TO VARYING THERMAL GRADIENTS Ph.D. Thesis - Paris Univ. [CALCUL DES DEFORMATIONS VISCO-PLASTIQUES D'UNE STRUCTURE SOUMISE A DES GRADIENTS THERMIQUES EVOLUTIFS]
Jean-Louis Chaboche 1972 77 p refs In FRENCH; ENGLISH summary
(ONERA-NT-194) Avail: NTIS HC $6.00

Nonlinear problems of elasto-viscoplasticity can now be solved with computers by means of a step-by-step in time linearization procedure. Simple one-dimensional and general three-dimensional methods are presented for the calculation of stresses and strains in structures subjected to varying complex loads and varying thermal gradients. The elasto-viscoplastic behavior is described by constitutive equations. The one-dimensional method is applicable to structures verifying Bernouilli's hypothesis: an application to a cooled turbine blade is shown. In the three-dimensional method, the equilibrium equations are solved at each step by Galerkin's method. An application to experimental verification is presented, for a two-dimensional structure: a rectangular plate heated on two sides and cooled on its median axis. Good agreement between theory and experiments validates the method. Some applications to more complex cases and convergence theorems are demonstrated.
Author (ESRO)

N73-13938# Pisa Univ. (Italy). Inst. of Aeronautics.
FATIGUE BEHAVIOR OF HAT SECTION STRINGER STIFFENED PANELS COMPRESSED IN THE POST BUCKLING RANGE Final Technical Report, Apr. 1971 - Mar. 1972
A. Salvetti and C. Casarosa Mar. 1972 59 p refs
(Contract DAJA37-71-C-1147)
(AD-748855) Avail: NTIS CSCL 01/3

This report includes the analytical and experimental research results of work conducted during the period of performance of the contract. Panels which were constructed using current aircraft construction techniques were subjected to compressive loads until buckling occurred. Both static and dynamic tests were performed. Strain gauge measurements were made on 29 panels constructed of 2024-T3 or 7075-T6 aluminum to determine the maximum allowable load and then to assess the fatigue damage on each panel. A statistical analysis of the static test results was made to determine the distribution of the maximum tensile stresses measured.
Author (GRA)

N73-13939# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
BUCKLING AND INITIAL POSTBUCKLING OF OVAL CYLINDRICAL SHELLS UNDER COMBINED AXIAL COMPRESSION AND BENDING
Joseph Kempner and Youl-Nan Chen Jul. 1972 61 p refs
(Contract F44620-69-C-0072; AF Proj. 9782)
(AD-747493; PIBAL-72-23; AFOSR-72-1565T) Avail: NTIS CSCL 20/11

Buckling and initial postbuckling of an oval cylindrical shell under pure bending and under combined uniform axial compression and bending is investigated. The first and second order stability equations are developed from the Donnell-type equations which are shown to be appropriate. The solution of these two sets of equations determines, respectively, the buckling characteristics and a sensitivity parameter. The buckling loads are found to be in good agreement with the engineering approximation based upon the assumption that buckling occurs when the local axial stress equals that corresponding to the classical buckling stress of a locally equivalent circular cylindrical shell under uniform axial compression.
Author (GRA)

N73-13940# North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
DEVELOPMENT OF A FINITE ELEMENT MODEL FOR THE CLASS 4 FLEXTENSIONAL UNDERWATER TRANSDUCER SHELL
George Georgopoulos and Larry H. Royster Sep. 1972 23 p
(Contract Nonr-486(11); NR Proj. 185-551)
(AD-748187; TR-23) Avail: NTIS CSCL 20/11

A finite element model is developed for the Class IV flextensional underwater transducer shell. The stiffness and mass matrices for a finite cylindrical type shell element of linearly varying radius of curvature are presented. The element has 36 degrees of freedom corresponding to the nine generalized coordinates at each node. All six rigid body modes for the element are adequately represented by this model. The element is used to predict the free vibrations for the Class IV flextensional underwater transducer shell, and the results are verified experimentally.
Author (GRA)

N73-13941# Pennsylvania State Univ., University Park. Dept. of Engineering Mechanics.
DYNAMIC RESPONSE OF VISCOPLASTIC BEAMS Progress Report, Oct. 1971 - Aug. 1972
Vernon H. Neubert, R. DiMarcello, W. Vogel, and R. Weiss Aug. 1972 54 p refs
(Contract N00014-67-A-0385-0010)
(AD-748656; PR-3) Avail: NTIS CSCL 13/13

The first part of the document presents results of shock tests on rectangular steel beams. The constants of a moment-curvature relationship, which includes rate effects, are related to experimental data. The second part presents a relationship between material parameters obtained from tension-compression tests to those in the moment-curvature equation. The third part presents theoretical response of a viscoplastic cantilever beam to a shock input.
Author (GRA)

N73-13942# North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
A FORTRAN PROGRAM FOR CALCULATING THE FREQUENCIES AND MODE SHAPES OF AN ARBITRARY SHAPE CYLINDRICAL TYPE SHELL BY UTILIZING A FINITE ELEMENT SOLUTION
George Georgopoulos and Larry H. Royster Sep. 1972 37 p refs
(Contract Nonr-486(11))
(AD-748655; TR-24) Avail: NTIS CSCL 20/11

The report describes a FORTRAN 4 program capable of obtaining a finite element numerical solution to the free axisymmetric vibrations of a cylindrical type shell of arbitrary shape.
Author (GRA)

N73-13943# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.

FREE VIBRATIONS OF RING STIFFENED TOROIDAL SHELLS. PART 2: NUMERICAL RESULTS
Theodore Balderes and Anthony E. Armenakas Jun. 1972 119 p refs
(Contract F44620-69-C-0072; AF Proj. 9782)
(AD-747024; PIBAL-72-22; AFOSR-72-1181TR) Avail: NTIS CSCL 20/11

In part 1 of the investigation, the free vibrations of ring stiffened toroidal shells were studied. The stiffening rings which were assumed placed at meridional sections, were treated as discrete members. Moreover, an arbitrary number of rings differing in properties and unequally spaced was considered. The shell segments, whose motion is accounted for within the linear shell theory, are coupled to the stiffeners by imposing compatibility at the junctions. In part 2 of the investigation, a computer program is employed to obtain numerical results. The frequencies of unstiffened toroidal shells are compared with available results and show concurrence to within 2.1%. Moreover, the iteration technique is shown to converge rapidly. Plots are established showing the effect of the shell parameters on the number of harmonics that must be retained for three-figure accuracy in the frequencies. Author (GRA)

N73-13944# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HARMONIC VIBRATIONS OF ELASTIC PLATES WITH SEPARATE RIBS
Diethelm Werner Jun. 1972 23 p refs Transl. into ENGLISH from Wiss. Z., Tech. Univ., Dresden, v. 19, no. 4, 1970 p 1031-1037
(AD-748906; FTD-HC-23-0502-72) Avail: NTIS CSCL 20/11

Reported is a description of a method of calculating the harmonic vibrations of elastic rectangular plates which are freely supported at two edges and are reinforced vertically with eccentric ribs. First the plate edge shear forces for the bending and shear stress states, as well as the loads on the ribs, are determined for unit displacements in general form. Once these values have been determined, four equations can be set up for each rib, which contain the requirement that for compatible displacements of ribs and plate edges the plate edge forces coming from the plates adjoining a rib and the external loads must be equivalent to the forces which deform the rib.
Author (GRA)

N73-13945# Watervliet Arsenal, N.Y. Benet Weapons Lab.
APPLICATION OF THE FINITE ELEMENT METHOD TO NONCONSERVATIVE STABILITY PROBLEMS WITH DAMPING
Julian J. Wu Aug. 1972 30 p refs
(DA Proj. 1F0-61102-A-35D)
(AD-748086; WVT-7238) Avail: NTIS CSCL 20/11

The method of finite elements in conjunction with an adjoint variational principle is applied to nonconservative problems in the theory of elastic stability. In this study, the effects of internal and external damping are included by assuming a Kelvin-Voigt material and a dissipative force proportional to the velocity, respectively. A boundary value problem that is the adjoint of the original problem is introduced, and in terms of the original and adjoint variables a complete functional is derived for an extended or generalized version of Hamilton's principle. This principle contains generalized expressions for the kinetic, potential, and dissipation energies that are bilinear forms in the original and adjoint variables. A cantilevered beam subjected to a concentrated follower's force with damping effects is analyzed. The finite element formulation emanates from this generalized version of Hamilton's principle. Author (GRA)

N73-13946# Alabama Univ., Huntsville. School of Graduate Studies and Research.
FINITE DEFORMATION OF ELASTIC PLATES, SHELLS, AND MEMBRANES BY THE FINITE ELEMENT METHOD
J. T. Oden Jul. 1972 30 p refs Repr. from Proc. of Shell Structures and Climatic Influences, Calgary, 3-6 Jul. 1972 p 63-89
(Contract F44620-69-C-0124; AF Proj. 9560)
(AD-749565; AFOSR-72-1849TR) Avail: NTIS CSCL 20/11

The paper surveys basic features of the theory of elastic membranes, general finite element models of elastic membranes, and represents numerical results obtained from static and dynamic problems. Author (GRA)

N73-13947# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
LARGE AMPLITUDE WAVES IN BOUNDED MEDIA. 1: REFLECTION AND TRANSMISSION OF LARGE AMPLITUDE SHOCKLESS PULSES AT AN INTERFACE
M. Cekirge and E. Varley May 1972 143 p refs
(Contracts DAAD05-69-C-0053; DAAD05-69-C-0389)
(AD-746642; CAM-140-1; BRL-CR-68) Avail: NTIS CSCL 20/11

The paper is in two parts. In the first part the reflection and transmission of an incident pulse when it arrives at an interface with a semi-infinite medium is described and the ideas of nonlinear impedance, reflection coefficient and transmission coefficient are introduced. In the second part of the paper a more detailed account is given of what happens when a pulse is partially reflected and partially transmitted at an interface. This is achieved by noting that the responses of many elastic materials can be correlated, both qualitatively and quantitatively, by a family of stress vs. strain laws for which the governing nonlinear equations for this problem can be solved exactly.
Author (GRA)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N73-13948 Princeton Univ., N.J.
UNSTEADY COMBUSTION IN GASEOUS PROPELLANT ROCKET MOTORS Ph.D. Thesis
Donald Roy Hardesty 1971 390 p
Avail: Univ. Microfilms Order No. 72-4781

The development of a consistent experimental and theoretical description of the phenomenon of intrinsic unstable combustion in the gas rocket is discussed. A determination was achieved of the contribution of gas phase rate processes, (in particular, chemical kinetics), to the coupling of a finite-dimensional unsteady turbulent combustion zone and finite amplitude (linear and nonlinear)longitudinal mode pressure oscillations. Experiments with the CO(H2O)/O2/N2 propellant system confirmed the critical importance of the mean combustion temperature in determining the onset of nonsteady burning. The spontaneous transition from a regime of steady combustion located about the stoichiometric mixture ratio to a regime of nonsteady combustion characterized by finite amplitude, constant frequency, longitudinal mode pressure oscillations occurs at approximately fixed combustion temperatures independent of the relative dilution of the combustible mixture.
Dissert. Abst.

N73-13949 Illinois Univ., Urbana.
AN EXTENDED THEORY OF IMPERFECT MODELING, WITH APPLICATION TO THE THERMAL MODELING OF SPACECRAFTS Ph.D. Thesis
Min-Nan Huang 1971 142 p
Avail: Univ. Microfilms Order No. 72-6959

Difficulties arise in practice in the modeling of real spacecraft mainly because of their structural complexity and, consequently, the need of satisfying a large number of similitude criteria. To partially overcome the difficulty, a new concept of model testing which makes use of imperfect models was developed and an approximate linear theory was proposed which has been found to yield satisfactory results when the errors in the modeling parameters are sufficiently small. In the present study, an attempt was made to relax the restriction so that larger errors in the modeling parameters might be accommodated. It is assumed that these errors can be adequately represented by a combination of linear and non-linear terms. This extended application, however, was achieved at the expense of two additional properly designed

experiments. Moreover, certain behavior of the nonlinear terms must be known, though only approximately. Dissert. Abstr.

N73-13950*# General Electric Co., Philadelphia, Pa. Space Div.
LONG LIFE RELIABILITY THERMAL CONTROL SYSTEMS STUDY Final Report, 1 Jul. 1970 - 31 Aug. 1972
T. R. Scollon, Jr. and R. E. Killen Aug. 1972 386 p refs
(Contract NAS8-26252)
(NASA-CR-123956; DOC-72SD4243) Avail: NTIS HC $21.50 CSCL 20M

The results of a program undertaken to conceptually design and evaluate a passive, high reliability, long life thermal control system for space station application are presented. The program consisted of four steps: (1) investigate and select potential thermal system elements; (2) conceive, evaluate and select a thermal control system using these elements; (3) conduct a verification test of a prototype segment of the selected system; and (4) evaluate the utilization of waste heat from the power supply. The result of this project is a conceptual thermal control system design which employs heat pipes as primary components, both for heat transport and temperature control. The system, its evaluation, and the test results are described. Author

N73-13951*# General Dynamics/Convair, San Diego, Calif.
OPTIMIZATION OF THERMAL PROTECTION SYSTEMS FOR THE SPACE VEHICLE. VOLUME 2: USER'S MANUAL
30 Oct. 1972 179 p refs
(Contract NAS9-11922)
(NASA-CR-128618; GDCA-DDB72-005-Vol-2) Avail: NTIS HC $11.00 CSCL 22B

The development of the computational techniques for the design optimization of thermal protection systems for the space shuttle vehicle are discussed. The resulting computer program was then used to perform initial optimization and sensitivity studies on a typical thermal protection system (TPS) to demonstrate its application to the space shuttle TPS design. The program was developed in FORTRAN IV for CDC 6400 computer, but it was subsequently converted to the FORTRAN V language to be used on the Univac 1108. Author

N73-13952*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
ASRDI OXYGEN TECHNOLOGY SURVEY. VOLUME 1: THERMOPHYSICAL PROPERTIES
Hans M. Roder, ed. and Lloyd A. Weber, ed. Washington NASA 1972 432 p Sponsored by NASA
(NASA-SP-3071) Avail: NTIS, HC $6.00 CSCL 20M

A handbook is presented of the thermodynamic functions, transport properties, and physical properties of both liquid and gaseous oxygen. A bibliography of references is included. F.O.S.

N73-13953# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
COMPUTER PROGRAMS FOR THERMODYNAMIC AND TRANSPORT PROPERTIES OF HYDROGEN (TABCODE-2)
H. M. Roder, R. D. McCarty, and W. J. Hall Oct. 1972 227 p refs
(NBS-TN-625) Avail: SOD $1.75 as C13.46:625

The thermodynamic and transport properties of para and equilibrium hydrogen have been programmed into a series of computer routines. Input variables are the pair's pressure-temperature and pressure-enthalpy. The programs cover the range from 1 to 500 psia with temperatures from the triple point to 6000 R or enthalpies from minus 130 BTU/lb to 25,000 BTU/lb. Output variables are enthalpy or temperature, density, entropy, thermal conductivity, viscosity, velocity of sound, heat capacity at constant pressure, heat capacity at constant volume, the heat capacity ratio, and a heat transfer parameter. Property values on the liquid and vapor boundaries are conveniently obtained through two small routines. Author

N73-13954# Lockheed Missiles and Space Co., Palo Alto, Calif.
CYCLE OF A THEORETICAL GAS REFRIGERATOR WITH FINITE DEAD VOLUMES
A. D. Suslov 1972 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Mashinostro. (Moscow), no. 8, 1972 p 81-85
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Theoretical cycles of a gas refrigerator machine are examined. An estimate is made of the influence of dead volumes in the apparatus on the individual processes and the efficiency of the cycle as a whole. Inclusion of the expansion and compression processes accompanying the gas displacement from the cold to the hot zone and back permits increasing the cycle efficiency somewhat. Author

N73-13955*# National Aeronautics and Space Administration, Washington, D.C.
THEORY OF SOLID COMPOSITE PROPERGOL COMBUSTION
Michel-Louis Bernard Dec. 1972 33 p refs Transl. into ENGLISH from Entropie (France), no. 40, Jul. - Aug. 1971 p 4-13
(NASA-TT-F-14720) Avail: NTIS HC $3.75 CSCL 21B

On the basis of a surface reaction as the limiting process of the ablation rate, a theory is presented for the combustion of ammonium perchlorate propellant. Ablation is expressed as a function of the fluid flow rate (Reynolds number) and pressure in a kinetic reaction. The effects of both high and low pressure on combustion are discussed along with the combustion of ammonium perchlorate in gaseous fuels, and the influence of the concentration of the binding agent. It is concluded that the theory accounts for a majority of rate laws for pressure, observed in practice. F.O.S.

N73-13956*# Brown Univ., Providence, R.I. Center for Dynamical Systems.
THE ENTROPY RATE ADMISSIBILITY CRITERION FOR SOLUTION OF HYPERBOLIC CONSERVATION LAWS
Constantine M. Dafermos 30 Nov. 1972 15 p refs
(Grant NGL-40-002-015; Contract N00014-67-A-0191-0009)
(NASA-CR-129594) Avail: NTIS HC $3.00 CSCL 20M

The entropy rate admissibility criterion for solutions of hyperbolic conservation laws is numerically analyzed. The following admissibility criterion for solutions of hyperbolic conservation laws is proposed: a weak solution is admissible if the total entropy decays with the highest possible rate. The equivalence of this criterion and viscosity criterion is established for the single equation and the system of equations of one dimensional nonlinear elasticity. Author

N73-13957# Joint Publications Research Service, Arlington, Va.
OUTSTANDING RESULTS OF SCIENTIFIC RESEARCH IN 1971 AT THE INSTITUTE OF HIGH TEMPERATURES OF THE USSR ACADEMY OF SCIENCES
V. P. Sirotkina, ed. and R. S. Skibitskaya, ed. 1 Dec. 1972 114 p refs Transl. into ENGLISH of the book "Vazhneyshiye Rezultaty Nauchno-Issledovatelskikh Rabot 1971 Goda, Institut Vysokikh Temperatur Akademii Nauk SSSR" Moscow 1972
(JPRS-57658) Avail: NTIS HC $7.75

Scientific research at U.S.S.R. Academy of Sciences of 1971 is presented. The subjects discussed are: (1) thermophysical and electrophysical properties of substances at high temperatures, (2) high temperature processes of heat transfer, mass transfer, and physical gasodynamics, (3) heat resistant structural materials, and (4) direct conversion of heat to electric power by MHD generators. Author

N73-13958*# North Carolina State Univ., Raleigh. Mechanical and Aerospace Engineering Dept.
CALCULATION OF HEAT TRANSFER ON SHUTTLE TYPE CONFIGURATIONS INCLUDING THE EFFECTS OF VARIABLE ENTROPY AT BOUNDARY LAYER EDGE
Fred R. DeJarnette Oct. 1972 98 p refs
(Contract NAS1-10277)
(NASA-CR-112180) Avail: NTIS HC $7.00 CSCL 20M

A relatively simple method is presented for including the effect of variable entropy at the boundary-layer edge in a heat transfer method developed previously. For each inviscid surface streamline an approximate shockwave shape is calculated using a modified form of Maslen's method for inviscid axisymmetric flows. The entropy for the streamline at the edge of the boundary layer is determined by equating the mass flux through the

shock wave to that inside the boundary layer. Approximations used in this technique allow the heating rates along each inviscid surface streamline to be calculated independent of the other streamlines. The shock standoff distances computed by the present method are found to compare well with those computed by Maslen's asymmetric method. Heating rates are presented for blunted circular and elliptical cones and a typical space shuttle orbiter at angles of attack. Variable entropy effects are found to increase heating rates downstream of the nose significantly higher than those computed using normal-shock entropy, and turbulent heating rates increased more than laminar rates. Effects of Reynolds number and angles of attack are also shown.
Author

N73-13959*# Aerojet Solid Propulsion Co., Sacramento, Calif.
ADVANCED SOLID PROPELLANT MOTOR INSULATION Final Report
P. L. Smith and R. F. Russ Jul. 1972 62 p
(Contract NAS2-6557)
(NASA-CR-114513) Avail: NTIS HC $5.25 CSCL 20M

An advanced lightweight insulation system suitable for use in long duration, low pressure planetary orbiter-type motor applications was developed. Experiments included the screening of various filler and binder materials with optimization studies combining the best of each. Small scale test motor data were used to judge the degree of success. Author

N73-13960*# Pittsburgh Univ., Pa.
BOILING INCEPTION IN TRICHLOROTRIFLUOROETHANE DURING FORCED CONVECTION AT HIGH PRESSURES
R. S. Dougall and T. E. Lippert Washington NASA Dec. 1972 57 p refs
(Grant NGL-39-011-079)
(NASA-CR-2170) Avail: NTIS HC $3.00 CSCL 20M

The inception of bubbles during forced convection was studied experimentally by using trichlorotrifluoroethane (R-113 or Freon-113). The experiments were performed in a rectangular channel, 12.7 x 9.5 mm in cross section. Heating was from a 3.2 mm wide strip embedded in the longer side of the channel. The pressures studied ranged from 3.6 to 20.7 bar, mass velocities from 700 to 600 kg/sq m/sec, and inlet subcoolings from 26 to 97 C. Photographs of the flow were used to determine when bubbles first appeared on the heated surface. These data were compared with wall temperature measurements and inception theories. A reasonable method for calculating the complete boiling curve was found to agree with these results. Author

N73-13961# Illinois Inst. of Tech., Chicago. Dept. of Physics.
THERMAL MEASUREMENTS ON SOLIDS BELOW 1 K Progress Report, Feb. 1971 - Feb. 1972
Harold Weinstock Feb. 1972 21 p refs
(Contract AT(11-1)-1629)
(COO-1629-31; PR-6) Avail: NTIS

The scattering behavior of electrons and phonons at normal superconducting phase boundaries was studied in MgO and carbon materials. Measurements were made at temperatures below 1 K. E.H.W.

N73-13962# New Mexico Univ., Albuquerque.
SIMILARITY ANALYSIS OF THERMAL STRESS
F. C. Wessling and R. E. D. Stewart (Sandia Labs.) Jun. 1972 72 p refs Sponsored by AEC
(SC-RR-710657) Avail: NTIS

A similarity analysis of the transient temperature and thermal stress distributions occurring in a homogeneous, isotropic solid of arbitrary shape, subjected to an arbitrary heating distribution over its surface, is carried out in order to derive the scaling relations necessary to properly model thermal shock problems. The analysis treats solids with temperature dependent properties, internal heat generation, and radiation from external surfaces. The results of the analysis are subsequently simplified for various special cases of interest. The particular case of a solid right circular cylinder with no internal heat generation, and subjected to a step function heating pulse over one end, is treated in some detail. Computer generated plots of the nondimensional temperatures and stresses occurring in solid zirconium dioxide cylinders as a function of nondimensional time or position are presented with other pertinent nondimensional similarity variables treated as parameters. Author (NSA)

N73-13963# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Angewandte Gasdynamik.
DETERMINATION OF A TIME-VARIABLE THERMAL STRESS ON A FINITE CYLINDER [ERMITTLUNG EINER ZEITHLICH VERAENDERLICHEN WAERMEBELASTUNG AUF EINEN ENDLICHEN ZYLINDER]
K. Kindler Sep. 1972 12 p refs In GERMAN Presented at the 5th Ann. DGLR Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-112) Avail: NTIS HC $3.00

An analytic solution is proposed for the Fourier differential equation of thermal conduction in a cylindrical bar with an arbitrary initial temperature and arbitrary temporal variation of the surface temperatures at both ends. The bar is thermally insulated except for the end surfaces. From the temporal development of the one dimensional temperature field within the bar, the thermal stresses at both ends can be deduced. Author (ESRO)

N73-13964# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.
A REFRIGERATION SYSTEM WITH COLD TRANSFER BY GAS CIRCULATION AND APPLICABILITY TO RESEARCH IN THE RANGE FROM 15 TO 80 K [EINE KAELTEANLAGE MIT KAELTETRANSPORT DURCH GASUMLAUF UND ANWENDUNGSMOEGLICHKEITEN FUER FORSCHUNG-SAUFGABEN IM BEREICH VON 15 K - 80 K]
Constantin Carpetis Mar. 1971 48 p refs In GERMAN; ENGLISH summary
(DLR-MITT-71-09) Avail: NTIS HC $4.50; DFVLR, Porz, West Ger. 15,30 DM

A refrigerating system using gas circulating in a closed circuit to transfer cold from a cryogenerator to the equipment site is described, and its advantages presented. The system has a refrigeration capacity of up to 800 W and consists of two gas transfer circuits, one with a minimum operating temperature of 15 K and the other 60 K. The cryogenerator and the gas circulating loop are described, as well as a liquefaction and pumping unit used for neon. Two examples of applications are presented; a high mass flow cryopump and cooling of MHD-converter windings. ESRO

N73-13965# California Univ., Berkeley. Dept. of Mechanical Engineering.
ON CONTINUUM THERMODYNAMICS
A. E. S. Greene and P. M. Naghdi Aug. 1972 54 p refs
(Contract N00014-69-A-0200-1008; NR Proj. 064-436)
(AD-748654; AM-72-4) Avail: NTIS CSCL 20/13

Within the scope of classical continuum thermodynamics, the authors elaborate on the basic concepts and adopt a different approach from usual to the formulation of conservation laws and an entropy production inequality, both for a single phase continuum and for a mixture of any number of constituents. These conservation laws and the entropy inequality can be regarded as applicable to both local and nonlocal problems. In the case of a single phase continuum and for a simple material which is homogeneous in its reference configuration, under fairly mild smoothness assumptions, the authors prove that all the conservation laws reduce to the usual classical ones and the entropy production inequality reduces to the Clausius-Duhem inequality. Some attention is given to possible redundancies in the basic concepts, as well as to alternative forms of the energy equation and the entropy inequality. The latter is particularly significant in regard to different but equivalent formulations of mixture theory. Author (GRA)

N73-13966# Stanford Research Inst., Menlo Park, Calif.
INVESTIGATION OF LOW-VELOCITY DETONATION PHENOMENA IN LIQUID PROPELLANTS, FUELS, AND EXPLOSIVES Final Report
David C. Wooten, Michael Cowperthwaite, and David C. Erlich 30 Jun. 1972 118 p refs
(Contract F44620-69-C-0079; AF Proj. 9711)
(AD-748438; AFOSR-72-1716TR) Avail: NTIS CSCL 19/4

Theoretical and experimental studies were performed to obtain

fundamental understanding of initiation and propagation of low-velocity detonation (LVD) in confined energetic liquids. LVD was modeled as a reactive shock propagation in a liquid cavitated by interactions with the container wall. Reaction required to support the wave in this cavitation model is initiated by bubble collapse in the compressed cavitation field. Methods of calculating LVD parameters were formulated with the hydrothermodynamics of the cavitation model, and a complete equation of state for nitromethane was introduced into the TIGER code to permit detonation calculations for incomplete reaction. GRA

N73-13967# Aerospace Corp., El Segundo, Calif.
LAMINAR, TRANSITIONAL, AND TURBULENT HEAT TRANSFER MEASUREMENTS ON A YAWED BLUNT CONICAL NOSETIP
George F. Widhopf 1 Sep. 1972 89 p refs
(Contract F04701-72-C-0073)
(AD-748292; TR-0073(S3450-60)-1; SAMSO-TR-72-209) Avail: NTIS CSCL 16/2

Laminar, transitional, and turbulent heat-transfer rates measured on a blunt (noise radius = 2.5 in.) 9-deg half-angle cone in a free stream M = 5 air flow at various angles of attack are presented. Measurements were made at nominal free-stream Reynolds numbers of 48.5, 19, 11, and 4.6 million per foot at nominal angles of attack = 0 deg, 5 deg, 10 deg, 15 deg, 20 deg, and 27 deg. The wall-to-stagnation temperature ratio varied between 0.20 and 0.29. Detailed circumferential and axial distributions of both the heat transfer rate and surface pressure were obtained over the entire model at each test condition and angle of attack. Author (GRA)

N73-13968# Naval Postgraduate School, Monterey, Calif.
INVERSION OF SOME LAPLACE TRANSFORMS ENCOUNTERED IN HEAT TRANSFER PROBLEMS
John E. Brock, Abdollah Zargary, and Craig Comstock 1 Sep. 1972 21 p refs
(AD-749329; NPS-59BC72091A) Avail: NTIS CSCL 20/13

The body of the paper presents the statement and proof of a theorem which affords the Laplace inversion of a rather general function encountered in our studies of some conjugated heat transfer problems. Appendices develop some suggestions concerning numerical evaluations and also present additional Laplace inversions which have not been previously tabulated. Author (GRA)

N73-13294 Joint Publications Research Service, Arlington, Va.
NUMERICAL SOLUTION TO THE PROBLEM OF COOLING A HOT GAS BUBBLE IN LIQUID
V. M. Ivchenko, N. A. Prikhodko, and V. S. Siryy *In its* Hydraulic Jet Flow of an Ideal Liquid and Gas-Liquid Mixtures 20 Oct. 1972 p 11-18 refs (For availability see N73-13292 04-12)

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N73-13969 University of Southern Calif., Los Angeles.
FEASIBILITY CRITERIA FOR THE ESTABLISHMENT OF COMMUNITY COLLEGE CURRICULA FOR AEROSPACE-AVIATION TRAINING Ph.D. Thesis
Thomas Osborne 1971 422 p
Avail: Univ. Microfilms Order No. 72-6092

Criteria for the development of air transportation curricula in a public two-year community college, current and future manpower needs of the air transportation industry in the Greater Los Angeles Metropolitan area, an air transportation curricula for community colleges serving large metropolitan areas to meet employment needs of citizens, and knowledge and skills essential to the development of air transportation programs are discussed. A definitive study was made of the literature relating to manpower needs and employment opportunities in major divisions of the air transportation industry. A list of criteria was developed from the literature and findings derived from the study to be used by community colleges as guidelines in evaluating and developing air transportation training programs. Dissert. Abstr.

N73-13970*# Midwest Research Inst., Kansas City, Mo.
ECONOMIC IMPACT OF STIMULATED TECHNOLOGICAL ACTIVITY. PART 3: CASE STUDY, KNOWLEDGE ADDITIONS AND EARTH LINKS FROM SPACE CREW SYSTEMS Final Report, 7 Apr. 1970 - 15 Oct. 1971
15 Oct. 1971 85 p refs
(Contract NASw-2030; MRI Proj. 3430-D)
(NASA-CR-129514) Avail: NTIS HC $6.25 CSCL 05B

A case study of knowledge contributions from the crew life support aspect of the manned space program is reported. The new information needed to be learned, the solutions developed, and the relation of new knowledge gained to earthly problems were investigated. Illustrations are given in the following categories: supplying atmosphere for spacecraft; providing carbon dioxide removal and recycling; providing contaminant control and removal; maintaining the body's thermal balance; protecting against the space hazards of decompression, radiation, and meteorites; minimizing fire and blast hazards; providing adequate light and conditions for adequate visual performance; providing mobility and work physiology; and providing adequate habitability. N.E.N.

N73-13971*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. Biotechnology and Power Dept.
COST ANALYSIS OF CARBON DIOXIDE CONCENTRATORS
M. M. Yakut 31 Aug. 1972 60 p refs
(Contract NAS8-28377)
(NASA-CR-123960; MDC-G3830) Avail: NTIS HC $5.00 CSCL 05C

A methodology is developed to predict the relevant contributions of the more intangible cost elements encountered in the development of flight-qualified hardware and is used to predict the costs of three carbon dioxide concentration systems. The cost and performance data from Gemini, Skylab, and other programs are utilized as a basis for establishing the cost estimating relationships. The concentration systems analyzed are the molecular sieves C02 concentrator, the hydrogen-depolarized concentrator, and the regenerable solid desiccant concentrator. Besides the cost estimates for each system, their comparative criteria including relative characteristics, operational differences, and development status are considered. Author

N73-13972# Defence Scientific Information Service, Ottawa (Ontario).
MICROFORMS IN DSIS: AN INFORMATION CENTER'S EXPERIENCE WITH MICROFORMS
John D. Currie Jul. 1972 28 p
(DSIS-TN-9) Avail: NTIS HC $3.50

Since 1965 DSIS has reproduced copies of microfiche documents received from outside sources for its customers. In 1970, in accordance with long-range plans to use microfiche as the back-up to an automated information retrieval system as a means of a quick and inexpensive way of supplying reports identified by a computer, DSIS began converting DRB reports received in paper form into original microfiche. Recently, use has been made of 16 mm microfilm cartridge systems containing indexes to reports processed by other information centers and usually held as microfiche. This report examines past experience, current projects, and future plans of DSIS. Author

N73-13973*# National Academy of Public Administration, Washington, D.C.
UNMANNED SPACE PROJECT MANAGEMENT: SURVEYOR AND LUNAR ORBITER
Erasmus H. Kloman NASA 1972 49 p Sponsored by NASA
(NASA-SP-4901; LC-72-600225) Avail: NTIS; SOD $0.45 CSCL 05A

An analysis of the management of two major NASA projects, Surveyor and Lunar Orbiter is presented. The analysis reflects the comments and criticisms of many NASA officials who were responsible for various phases of the projects as well as comments by knowledgeable persons outside NASA. Findings are submitted with respect to: (1) environment, (2) role of individuals, (3)

teamwork, (4) roles and missions, (5) organization, and (6) cost performance. P.N.F.

N73-13974# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
TECHNICAL PUBLICATIONS AND PRESENTATIONS, 1971
1971 35 p refs
(AD-746707; ARL-MR-72-0001) Avail: NTIS HC $3.75

Technical publications and presentations produced by the Aerospace Research Laboratories of the U.S. Air Force for calendar year 1971 are presented in the form of titles and authors. The subjects covered are: (1) applied mathematics, (2) energy conversion, (3) fluid dynamics, (4) hypersonic research, (5) chemistry research, (6) metallurgy and ceramics, (7) plasma physics, and (8) thermomechanics. P.N.F.

N73-13975# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).
ANNUAL REPORT, 1971 [JAHRESBERICHT 1971]
1971 594 p refs In GERMAN
Avail: NTIS HC $31.75

The annual report covers work on flow mechanics, aerodynamic flight control, materials strengths and construction methods, propulsion and energy, electronics, space physics, space simulation, and aerospace medicine. Briefly discussed are also activities at five data processing centers, air traffic problems, and interdisciplinary aerospace research. Transl. by G.G.

N73-13976# Hokkaido Univ., Sapporo (Japan).
THE INSTITUTE OF LOW TEMPERATURE SCIENCE
1972 19 p refs
Avail: NTIS HC $3.00

The organization and functions of the institute for Low Temperature Science of the Hokkaido University, Sapporo, Japan are presented. The equipment used in conducting low temperature research is described. The personnel of the school are named and the more important results of the research projects are discussed. P.N.F.

N73-13977*# Mathematica, Inc., Princeton, N.J.
ECONOMIC ANALYSIS OF THE SPACE SHUTTLE SYSTEM, VOLUME 1
31 Jan. 1972 253 p refs
(Contract NASw-2081)
(NASA-CR-129568) Avail: NTIS HC $14.75 CSCL 05C

An economic analysis of the space shuttle system is presented. The analysis is based on economic benefits, recurring costs, non-recurring costs, and economic tradeoff functions. The most economic space shuttle configuration is determined on the basis of: (1) objectives of reusable space transportation system, (2) various space transportation systems considered and (3) alternative space shuttle systems. P.N.F.

N73-13978*# Mathematica, Inc., Princeton, N.J.
ECONOMIC ANALYSIS OF THE SPACE SHUTTLE SYSTEM, VOLUME 2
31 Jan. 1972 318 p refs
(Contract NASw-2081)
(NASA-CR-129571) Avail: NTIS HC $18.00 CSCL 05C
For Abstract see N73-13977

N73-13979*# Mathematica, Inc., Princeton, N.J.
ECONOMIC ANALYSIS OF THE SPACE SHUTTLE SYSTEM, VOLUME 3
31 Jan. 1972 232 p refs
(Contract NASw-2081)
(NASA-CR-129569) Avail: NTIS HC $13.75 CSCL 05C
For Abstract See N73-13977

N73-13980*# Mathematica, Inc., Princeton, N.J.
ECONOMIC ANALYSIS OF THE SPACE SHUTTLE SYSTEM: EXECUTIVE SUMMARY
31 Jan. 1972 63 p
(Contract NASw-2081)
(NASA-CR-129570) Avail: NTIS HC $5.25 CSCL 05C
For Abstract See N73-13977

N73-13981# Committee on Science and Astronautics (U. S. House).
FIRE RESEARCH AND SAFETY
Washington GPO 1972 109 p Hearings before Comm. on Sci. and Astronaut., 92d Congr., 2d Sess., No. 26, 10-11 Oct. 1972
Avail: Subcomm. on Sci., Res., and Develop.

Hearings before the Subcommittee on Science, Research and Development of the Committee on Science and Astronautics of the House of Representatives, Ninety-Second Congress are presented. The subjects discussed are: (1) establishment of National Fire Academy, (2) government subsidy of training programs, (3) financial assistance to local fire departments for equipment, and (4) establishment of fire data and information clearinghouse. P.N.F.

N73-13982*# Air Force Dept., Washington, D.C.
RESEARCH AND DEVELOPMENT CONTRIBUTIONS TO AVIATION PROGRESS (RADCAP), VOLUME 1
John G. Paulisick Aug. 1972 123 p refs Sponsored by NASA, DOT, and DOD 2 Vol.
(NASA-CR-129572) Avail: NTIS HC $8.25 CSCL 05D
For abstract, see N73-13984

N73-13983*# Air Force Dept., Washington, D.C.
RESEARCH AND DEVELOPMENT CONTRIBUTIONS TO AVIATION PROGRESS (RADCAP), VOLUME 2, APPENDICES 1 THRU 9
Charles R. Hudson, Jr. Aug. 1972 606 p refs Sponsored by NASA, DOT, and DOD 2 Vol.
(NASA-CR-129573) Avail: NTIS HC $32.50 CSCL 05D
For abstract, see N73-13984.

N73-13984*# Air Force Dept., Washington, D.C.
RESEARCH AND DEVELOPMENT CONTRIBUTIONS TO AVIATION PROGRESS (RADCAP): EXECUTIVE SUMMARY
Aug. 1972 39 p Sponsored jointly by DOD, NASA, and DOT
(NASA-CR-129574) Avail: NTIS HC $4.00 CSCL 05D

Positive contributions of military aeronautical research and development programs to civil aviation are reviewed and some possible future contributions of those military programs are assessed. A summary is presented of detailed results concerned with: (1) review of the progress that has been made in aviation since 1925 and the significant technological advances that have been made; (2) an examination of current and planned military aeronautical research and technology programs and an assessment of their relevancy to the aeronautical R and D needs of civil aviation; (3) the relationship of the development base generated by military programs to the needs of civil airliner design, development, and production; (4) information on aeronautical R and D funding; and (5) the findings and observations of the RADCAP study. Author

N73-13985*# National Aeronautics and Space Administration, Washington, D.C.
CALENDAR OF FRENCH SPACE EVENTS FOR 1971
Dec. 1972 13 p refs Transl. into ENGLISH of "Calendrier des Evenements Spatiaux Francais pour l'Annee" Paris, CNES, 19 Feb. 1971
(NASA-TT-F-14721) Avail: NTIS HC $3.00 CSCL 05B

A chronological listing of significant activities of the French space program is presented for 1971. N.E.N.

N73-13986*# Massachusetts Inst. of Tech., Cambridge. Alfred P. Sloan School of Management.
AN EXPERIMENT WITH INTERACTIVE PLANNING MODELS Working Paper
James Beville, John H. Wagner, and Zenon S. Zannetos Dec. 1970 30 p refs Supported in part by the Army Mater. Command, the Land Educ. Develop. grant, and by IBM
(Grant NGL-22-009-309)
(NASA-CR-129592; Rept-503-70) Avail: NTIS HC $3.50 CSCL 05A

Experiments on decision making in planning problems are described. Executives were tested in dealing with capital investments and competitive pricing decisions under conditions of uncertainty. A software package, the interactive risk analysis model system, was developed, and two controlled experiments

were conducted. It is concluded that planning models can aid management, and predicted uses of the models are as a central tool, as an educational tool, to improve consistency in decision making, to improve communications, and as a tool for consensus decision making. N.E.N.

N73-13987*# George Washington Univ., Washington, D.C. Program of Policy Studies in Science and Technology.
TOWARD A NEW FEDERAL POLICY FOR TECHNOLOGY: THE OUTLINE EMERGES
John M. Logsdon Aug. 1972 32 p refs
(Grants NGL-09-010-030; NSF GS-34902)
(NASA-CR-129669; GWPS-SDP-408) Avail: NTIS HC $3.75 CSCL 05D

The development is traced of a new federal policy for the support and use of technology. The premises underlying such a policy and forecasts of likely future developments are analyzed. The first Presidential message on science and technology is included. Author

N73-13988# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 282
21 Nov. 1972 32 p refs Transl. into ENGLISH from various Eastern European publications
(JPRS-57570) Avail: NTIS HC $3.75

Articles are presented concerning the development of and progress in the various theoretical and applied scientific disciplines and technical fields; and the administration, structure, personnel, and research plans of leading Polish scientific organizations and institutions, particularly the Academy of Sciences. Author

N73-13989# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 283
22 Nov. 1972 34 p refs Transl. into ENGLISH from various Eastern European publications
(JPRS-57583) Avail: NTIS HC $3.75

Articles presented treat the development of and progress in the various theoretical and applied scientific disciplines and technical fields; and the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences. Author

N73-13990# RAND Corp., Santa Monica, Calif.
THE VERY HIGH SPEED TRANSIT SYSTEM
R. M. Salter Aug. 1972 18 p ref
(P-4874) Avail: NTIS HC $3.00

The development of a very high speed transit system is discussed. The equipment proposed for use with the system and the advantages to be obtained are analyzed. The technical aspects are examined to show: (1) turning speed constraints, (2) effects of aerodynamic drag, (3) tunneling considerations, and (4) development of high speed freight system. P.N.F.

N73-13991*# Massachusetts Inst. of Tech., Cambridge. Sloan School of Management.
REWARD AND UNCERTAINTY IN EXPLORATION PROGRAMS
Gordon M. Kaufman and Paul G. Bradley (British Columbia Univ.) [1971] 25 p refs
(Grant NGL-22-009-309)
(NASA-CR-129595) Avail: NTIS HC $3.25 CSCL 05A

A set of variables which are crucial to the economic outcome of petroleum exploration are discussed. These are treated as random variables; the values they assume indicate the number of successes that occur in a drilling program and determine, for a particular discovery, the unit production cost and net economic return if that reservoir is developed. In specifying the joint probability law for those variables, extreme and probably unrealistic assumptions are made. In particular, the different random variables are assumed to be independently distributed. Using postulated probability functions and specified parameters, values are generated for selected random variables, such as reservoir size. From this set of values the economic magnitudes of interest, net return and unit production cost are computed. This constitutes a single trial, and the procedure is repeated many times. The resulting histograms approximate the probability density functions of the variables which describe the economic outcomes of an exploratory drilling program. Author

N73-13992*# Massachusetts Inst. of Tech., Cambridge. Sloan School of Management.
TWO STOCHASTIC MODELS USEFUL IN PETROLEUM EXPLORATION
Gordon M. Kaufman and Paul G. Bradley (British Columbia Univ.) [1972] 19 p refs
(Grant NGL-22-009-309)
(NASA-CR-129611) Avail: NTIS HC $3.00 CSCL 05A

A model of the petroleum exploration process that tests empirically the hypothesis that at an early stage in the exploration of a basin, the process behaves like sampling without replacement is proposed along with a model of the spatial distribution of petroleum reservoirs that conforms to observed facts. In developing the model of discovery, the following topics are discussed: probabilistic proportionality, likelihood function, and maximum likelihood estimation. In addition, the spatial model is described, which is defined as a stochastic process generating values of a sequence or random variables in a way that simulates the frequency distribution of areal extent, the geographic location, and shape of oil deposits F.O.S.

N73-13993*# Massachusetts Inst. of Tech., Cambridge. Sloan School of Management.
THE MANAGEMENT PROCESS, MANAGEMENT INFORMATION AND CONTROL SYSTEMS, AND CYBERNETICS
Zenon S. Zannetos and Jarrod W. Wilcox [1972] 26 p refs
(Grant NGL-22-009-309)
(NASA-CR-129728) Avail: NTIS HC $3.50 CSCL 05A

An attempt has been made to analyze the strengths and weaknesses of the cybernetics approach as applied to management. The conclusion is that cybernetics can serve not only as a conceptual philosophical aid, but also as an operational tool in both managerial planning and control. So far, however, most of its promise is yet unrealized, especially in the planning sphere. Only in the area of control of operations has the impact of this promising field shown tangible results. Author

N73-13994# General Accounting Office, Washington, D.C.
MEANS FOR INCREASING THE USE OF DEFENSE TECHNOLOGY FOR URGENT PUBLIC PROBLEMS
Elmer B. Staats 29 Dec. 1972 63 p refs
(B-175132) Avail: NTIS HC $5.25

The transfer of technology resulting from defense research and development to the solution of urgent public problems is discussed. The secondary application of technology to fill a different need in another environment is the basic consideration. The subjects discussed are: (1) relative roles and responsibilities of the Department of Defense and Federal civil agencies in the transfer process, (2) legislative and organizational factors which influence the transfer, and (3) assessment of need for improved policies and procedures to enhance technology transfer. Author

N73-13995# Freiburg Univ. (West Germany).
DEVELOPMENT OBJECTIVES IN THE FIELD OF COMPUTER-ASSISTED EDUCATION [ZIELSYSTEM FUER DIE FOERDERUNG IM BEREICH DATENVERARBEITUNG IM BILDUNGSWESEN]
K. Haefner Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Sep. 1972 97 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-DV-72-05) Avail: NTIS HC $7.00; Zentralstelle fuer Atomkernenergie-dokumentation (ZAED), Leopoldshafen, West Ger.

Feasible research, development, and applications projects in the area of computer application to education are characterized. This is done by creating about 80 descriptors. Their meaningful combination permits the generation of all projects. A summary is given of the present trends in the field, with special emphasis on activities in the Federal Republic of Germany. A subset of projects is derived from all possible projects by applying a set of criteria. This subset defines a series of projects which should be supported. Author (ESRO)

N73-13996# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 26, NO. 8
John M. Leonard and Victoria S. Hewitson 31 Aug. 1972 39 p
(AD-747959) Avail: NTIS CSCL 05/2

The report is a monthly publication presenting brief articles concerning recent developments in European scientific research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to American scientists by disclosing interesting information well in advance of the usual scientific publications. Author (GRA)

N73-13997# Phillips Scientific Corp., Bartlesville, Okla.
INVESTIGATION OF NAVY AIRCRAFT FUEL DISPENSING METHODS
D. P. Keeler and E. E. Kleinmann Apr. 1972 212 p
(Contract N00025-71-C-0026)
(AD-748211) Avail: NTIS CSCL 15/5

The report is the result of study to determine the most effective, practical, and economical system for onshore fueling of Navy aircraft, including fighters, patrol, helicopters, and transport aircraft. The Recommended Service Station Fueling System is a pressure system automatically controlled by fuel demand, utilizing groups of pumps, filter-separators, and a pipeline distribution system arranged for extreme flexibility and simplicity in operation. A minimum of hydraulic and electric controls are used, and no radio or telephone is required for coordination of fueling. The Recommended Service Station Fueling System consists of fueling spots to which aircraft come for fueling. Each fueling spot consists of a meter, a primary and secondary pressure control valve, a filter-separator, and a loading hose or arm to transfer fuel from a pipeline to the aircraft. Author (GRA)

N73-13998# Informatics, Inc., Rockville, Md. Interim Report
SELECTED MATERIALS FROM SOVIET TECHNICAL LITERATURE, MARCH 1972
Stuart G. Hibben 28 Apr. 1972 123 p refs
(Contract F44620-72-C-0054; ARPA Order 1622-3)
(AD-749487; AFOSR-72-1923TR) Avail: NTIS CSCL 20/5

The report includes abstracts and bibliographic lists on major contractual subjects that were completed in March, 1972. The major topics are: laser technology, effects of strong explosions, geosciences, and particle beams. The abstracted material includes some selections prior to 1972 that have not otherwise been reported. Author (GRA)

N73-13834* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPLICATION OF NASA MANAGEMENT APPROACH TO SOLVE COMPLEX PROBLEMS ON EARTH
John S. Potate *In its* Space for Mankind's Benefit 1972 p 83-92 (For availability see N73-13829 04-30)
CSCL 05A

N73-13836* Committee on Science and Astronautics (U. S. House).
SPIRITUAL IMPACTS OF THE SPACE PROGRAM ON THE WORLD
Marvin Esch *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 97-98 (For availability see N73-13829 04-30)
CSCL 05K

N73-13863* North American Rockwell Corp., Downey, Calif. Space Div.
EXTRATERRESTRIAL IMPERATIVE
Krafft A. Ehricke *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 341-352 (For availability see N73-13829 04-30)
CSCL 03B

N73-13867* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPLICATION OF SPACE BENEFITS TO EDUCATION
Konrad K. Dannenberg and Frederick I. Ordway, III (Ala. Univ., Huntsville) *In its* Space for Mankind's Benefit 1972 p 391-396 Prepared in cooperation with Ala. Univ., Huntsville (For availability see N73-13829 04-30)
CSCL 05B

N73-13868* Howard Univ., Washington, D.C.
FROM SPACE: OUR HOUSING HOPES?
L. Alberto Scipio, II *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 397-421 refs (For availability see N73-13829 04-30)
CSCL 05A

N73-13871* George Washington Univ., Washington, D.C. International Studies Group.
THE POLITICAL AND LEGAL ASPECTS OF SPACE APPLICATIONS
John Hanessian, Jr. *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 443-447 (For availability see N73-13829 04-30)
CSCL 05D

N73-13872* Alabama A & M Univ., Normal. Center of Intercultural Studies.
SPACE EXPLORATION AND WORLD PEACE
Charles Mercieca *In* NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 449-452 (For availability see N73-13829 04-30)
CSCL 05K

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